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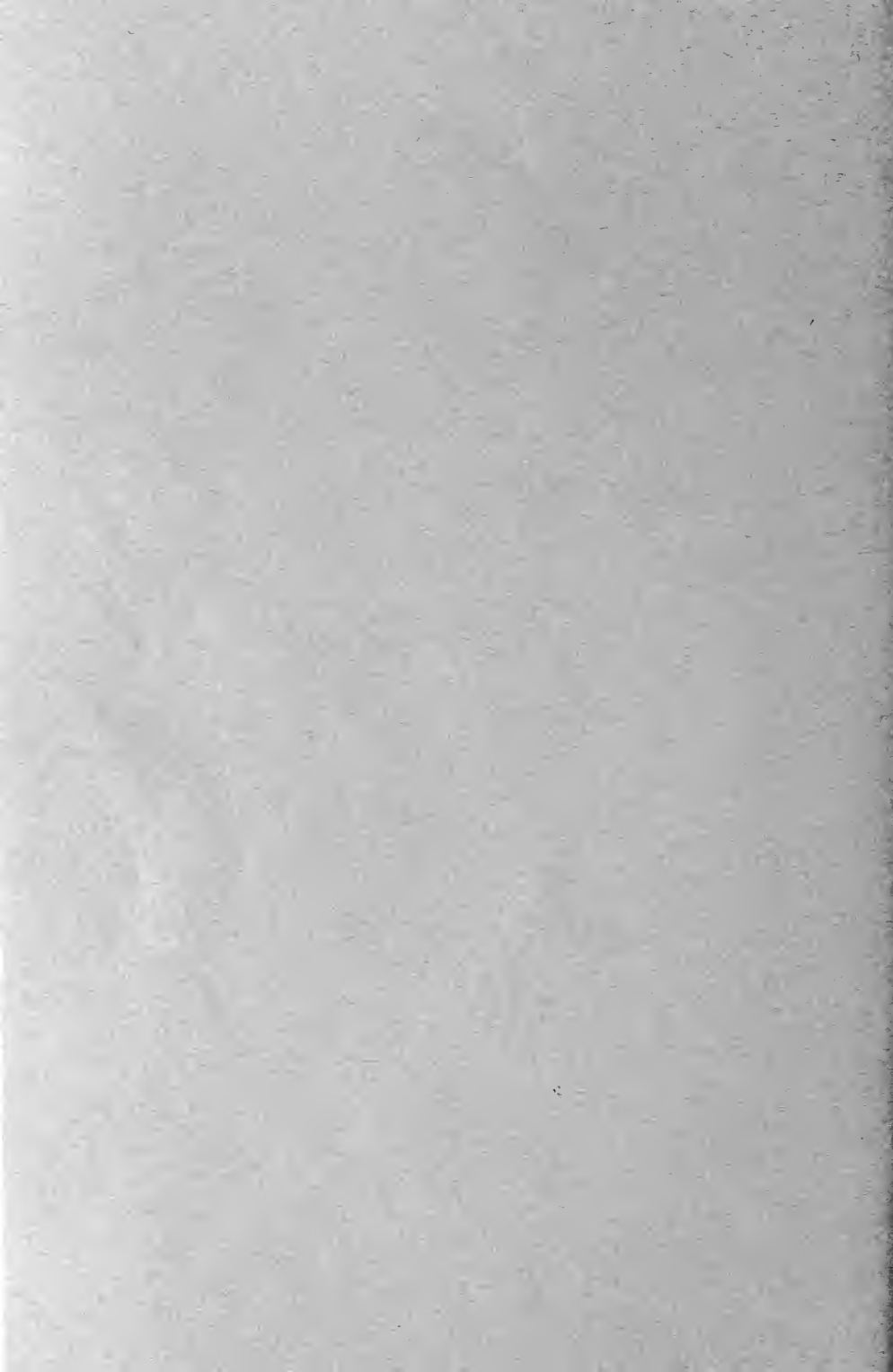
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ARNOLD ARBORETUM
HARVARD UNIVERSITY

ARNOLDIA



A continuation of the
BULLETIN OF POPULAR INFORMATION

VOLUME XV

1955

PUBLISHED BY THE
ARNOLD ARBORETUM
JAMAICA PLAIN, MASSACHUSETTS

ARNOLDIA



A continuation of the BULLETIN OF POPULAR INFORMATION of the Arnold Arboretum, Harvard University

VOLUME 15

MARCH 18, 1955

NUMBER 1

FORCING HARDY WOODY PLANTS IN THE GREENHOUSE FOR EARLY BLOOM

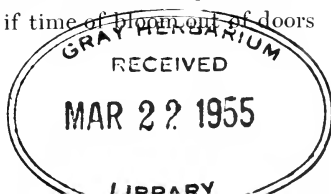
FORCING plants indoors to produce gorgeous bloom for spring flower shows has become a favorite indoor sport for many a commercial grower. The Arnold Arboretum tried valiantly to refrain from this type of activity but has had to succumb. When it came to figuring the time to bring in plants from outdoors so that they would produce the proper amount of flowers at the exact time the judges toured the show, it was woefully clear that there was not much published information which would help rank amateurs at this game. The experienced growers, who had been doing this for years, either kept such facts in their heads or else tucked away in some attic file which was referred to briefly once a year.

Many growers helped the amateurs of the Arboretum with timely suggestions, but we wanted to have something more definite than a "guess" to go by. Consequently, we kept records of when the plants were brought into the greenhouse, how long it took them to come into flower, and at what greenhouse temperatures. The old-timers say, that such information is not of much value, since the number of days for blooming depends on the amount of "cold" (i.e., dormant period) the plant has received previously, the amount of rainfall the previous summer and fall, the temperature of the greenhouse, the number of days with sunshine after the plants have been taken into the greenhouse, etc.

All of which is understandable, nevertheless, we wanted the records on paper to help us with such forcing for future shows.

Consequently, the plant propagator, Mr. Coggeshall, kept a record of the dates the plants were brought into the greenhouse, and the number of days it took to force them into bloom. Included with the plants were two sets of cut branches, cut from the same plants but at different times, to determine the length of time it would take to bring these into bloom also. The greenhouse was kept at about 55°-60° F. night temperature. The idea was to see if time of bloom out of doors

[1]



(which is known) could be correlated with the number of days necessary to bring the branches into bloom in the greenhouse, and also to see whether shrubs with a ball of soil about the roots would bloom (when forced) in about as many days as the cut branches.

BRANCHES OF SHRUBS FORCED IN A GREENHOUSE
With Night Temperatures of 55°-60° F.

	<i>No. of days to bloom when cut Jan. 28</i>	<i>No. of days to bloom when cut March 18</i>	<i>Date of normal bloom out of doors</i>
<i>Abeliophyllum distichum</i>	20	6	April 5
<i>Acer rubrum</i>	22	6	April 5
<i>Cercis canadensis</i>	39	13	May 5
<i>Chaenomeles lagenaria</i>	39	—	May 5
<i>Cornus florida</i>	45	22	May 15
<i>Cornus mas</i>	19	0	April 5
<i>Deutzia lemoinei</i>	45	35	May 25
<i>Forsythia ovata</i>	18	8	April 5
<i>Forsythia suspensa</i>	20	6	April 15
<i>Halesia monticola rosea</i>	44	22	May 15
<i>Hamamelis japonica</i>	16	—	March
<i>Kalmia latifolia</i>	79	—	June 15
<i>Kolkwitzia amabilis</i>	—	38	June 5
<i>Leucothoe racemosa</i>	77	35	June 5
<i>Lonicera standishi</i>	16	5	April 15
<i>Magnolia soulangeana superba</i>	38	—	May 5
“ <i>stellata</i>	—	9	April 25
<i>Pieris floribunda</i>	30	12	April 25
“ <i>japonica</i>	24	9	April 15
<i>Prunus sargentii</i>	32	12	April 25
“ <i>tomentosa</i>	26	15	April 25
“ <i>triloba</i>	29	13	April 25
“ <i>yedoensis</i>	30	13	April 25
<i>Rhododendron calendulaceum</i>	77	38	June 5
“ <i>carolinianum</i>	53	31	May 15
“ <i>fortunei</i>	91	—	June 15
“ <i>mucronulatum</i>	21	8	April 15
“ <i>obtusum kaempferi</i>	43	29	May 15
“ <i>schlippenbachii</i>	43	18	May 15
“ <i>yedoense poukhanense</i>	50	31	May 15
<i>Ribes odoratum</i>	26	16	May 15
<i>Spiraea prunifolia</i>	31	9	April 25
“ <i>thunbergii</i>	29	12	May 5
<i>Styrax japonica</i>	65	36	June 5
<i>Viburnum sargentii</i>	—	50	June 5

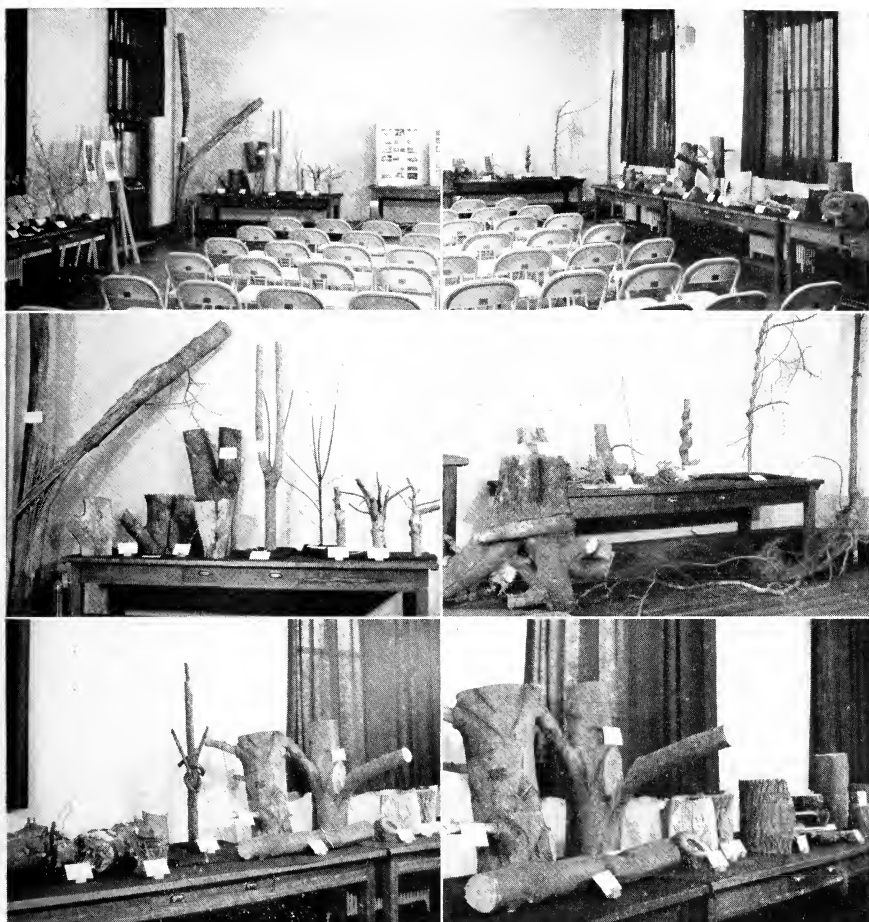


PLATE I

Pruning exhibit in the new lecture-demonstration hall in the Administration Building of the Arnold Arboretum. This exhibit is open to the public Monday through Friday from 9 A.M. to 5 P.M. from March 1 on for several months. In visiting the Arboretum, stop in to see this very practical exhibit.

PLANTS BROUGHT IN JANUARY 11

	<i>No. of days to bloom</i>	<i>Date of normal bloom out of doors</i>
<i>Iberis sempervirens</i>	25	May 15
<i>Alyssum saxatile compactum</i>	28	May 15
<i>Convallaria majalis</i>	28	May 15

PLANTS BROUGHT IN JANUARY 28

<i>Deutzia scabra</i>	45	June 25
“ <i>gracilis</i>	45	May 25
<i>Rhododendron racemosum</i>	35	May 5
“ <i>obtusum kaempferi</i>	38	May 15
<i>Weigela hortensis</i>	40	May 15

PLANTS BROUGHT IN FEBRUARY 1

<i>Prunus sargentii</i>	28	April 25
“ <i>yedoensis</i>	28	April 25
<i>Malus halliana parkmani</i>	38	May 5
<i>Chaenomeles lagenaria</i>	35	May 5
<i>Rhododendron mucronatum</i>	32	May 5
<i>Vinca minor</i>	20	April 25

PLANTS BROUGHT IN FEBRUARY 8

<i>Forsythia suspensa</i>	20	April 15
<i>Magnolia stellata</i>	34	April 25
<i>Pieris japonica</i>	24	April 15

Only a few plants were forced in our greenhouses last year, but the above results show that plants blooming at the same time out of doors, can be forced into bloom indoors in about the same number of days. The later they bloom out of doors, the longer they take indoors, naturally. Also, plants dug with a ball of soil can be forced in *about* the same length of time as cut branches, under the same conditions. It goes without saying, that with higher greenhouse temperatures at night, the number of days to bloom can be further reduced. In other words, and with wide allowances for many variables, the time for forcing cut branches indoors can be summarized as follows:

CUT BRANCHES

Approximate number of days to bloom in greenhouse with night
temperatures of 55°-60° F.

16	March	-
18-22	April 6	6-8
20-31	April 15	5-12
26-32	April 25	9-12
26-39	May 5	13-16
43-50	May 15	18-31
45	May 25	35
65-77	June 5	35-50
79-91	June 15	-

DONALD WYMAN

ARNOLDIA



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VOLUME 15

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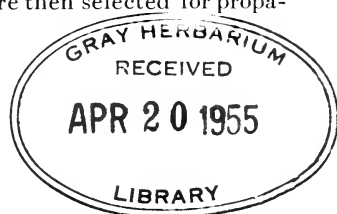
PLANT BREEDING AT THE ARNOLD ARBORETUM

THE introduction of trees and shrubs of horticultural interest has been an important function of the Arnold Arboretum for many years. Since its founding over seventy five years ago the Arnold Arboretum has been responsible for the introduction of nearly 3000 species and varieties of woody plants new to this country. Many of these have proven to be valuable ornamentals and are now widely distributed — commonly seen around homes, in parks and gardens and featured in other arboreta.

The staff of the Arnold Arboretum has also been actively engaged in the development of new or improved ornamental trees and shrubs through plant breeding. The techniques of the plant breeder: hybridization, back-crossing, selection, used in the past to develop the now numerous varieties of roses, lilacs and rhododendrons, are being applied at the Arnold Arboretum to crab apples, forsythias, magnolias and other ornamental trees and shrubs. The plant explorer will continue to select and introduce plants new to America. The plant breeder will continue to use the best characteristics of each introduction to develop even more desirable ornamentals.

The breeding of new horticultural varieties of trees and shrubs requires much patience for the results may not be evident for many years. The actual transfer of pollen between species or varieties to produce the hybrid seed is only the first of many steps, and detailed records must be kept through all steps. The hybrid seeds are carefully collected and stored. Many must be stratified to insure germination and some require two years for this process. The seeds are planted in the greenhouse in the early spring and the seedlings transferred to the nursery a few months later. After a year or two in the nursery they are planted in rows ten feet apart with the plants 2-5 feet apart in the row. Here they remain until they flower — which may be several years, but often 5-10 years. The more promising types, as measured by leaf and flower characters, are then selected for propa-

[5]



gation and again grown in the nursery for several years. They are then planted with sufficient spacing and in several locations, to test for growth habit, size and hardiness. The hybrids which pass this test are then selected and propagated for distribution to the commercial nurserymen, who in turn must propagate them for distribution to the public. Thus it may take 10-20 years or more before the new hybrid becomes available to the horticultural public.

The plant breeding work at the Arboretum has covered a wide range of genera with emphasis in recent years on the production of small or dwarf trees and shrubs to meet modern landscape designs. Since the average home owner—or his wife—is also the gardener, the trees and shrubs which are planted should be hardy and require a minimum amount of pruning, cultivation and spraying.

One of the first hybrids released in recent years by the Arnold Arboretum was an ornamental cherry, named as a tribute to the writer's wife and given her maiden name "Hally Jolivette." The French name Jolivette is also appropriate since it means "pretty little one." This flowering cherry is a hybrid between *Prunus subhirtella* and a variety of *P. apetala*. It is a small tree of graceful habit and comes into flower the second or third year from the time of propagation from cuttings or by budding on *P. subhirtella* rootstocks. The flowers are semidouble, white with a light pink center, and open up in succession so that the tree is in bloom for several weeks. The branches are dark and slender and at dusk the white flowers appear to be floating in air. This variety, like all cherries, likes full sun and well-drained soil. It is now available from a few commercial nurserymen. Mature specimens can be seen on the Bussey grounds and in the cherry collection of the Arboretum just inside the Forest Hills gate.

Neither nature nor the plant breeder has yet produced the ideal variety of ornamental apple. It should be of small or moderate size, have attractive flowers which retain their color and texture until the petals drop, be of graceful growth habit while at the same time requiring little pruning, have foliage that will become colorful in the fall and possess attractive fruit remaining on the tree until late fall.

Most of the apple hybrids made at the Arnold Arboretum have involved parental varieties of hybrid origin such as *M. arnoldiana*, *M. pumila niedzwetzkyana*, and *M. purpurea eleyi*. As a result the progeny have been extremely variable providing a great range of genetic recombinations. Many of the best oriental species are apomictic and produce only maternal types of offspring, but *M. sargentii* proved to be facultatively apomictic and occasional sexual hybrids have been obtained by artificial pollination.

One of the first apple hybrids released by the Arboretum is a hybrid between *M. arnoldiana* and *M. pumila niedzwetzkyana*, distributed under the number 19039. It has been named "Henrietta Crosby" in honor of Mrs. V. R. Crosby,* who has

*The cultivars being named for the first time in this paper are *Malus*×"Henrietta Crosby," *Malus*×"Blanche Ames," *Malus*×"Henry F. du Pont," and *Malus*×"Mary Potter."

long been a member of the Arnold Arboretum Visiting Committee. This variety is of moderate size, of graceful growth habit, with large single pink (China Rose 025/1) flowers which hold their color well. The fruits are about an inch in diameter, and bright red in color. Mature trees of this variety are on the Bussey grounds adjacent to the Arboretum and at the Case Estate in Weston. It has been distributed to commercial nurserymen, but has not yet been placed on the market.

Another attractive ornamental apple is an open pollinated offspring of *M. spectabilis riversi* distributed under number 6639. This variety has been named "Blanche Ames" in honor of Mrs. Oakes Ames, a distinguished botanical artist and wife of the late Oakes Ames, former administrator of the Arnold Arboretum. This variety is a rather small tree which has a most attractive growth habit. The flower buds are pink and open up as semidouble white blossoms with a tinge of pink on the outer petals. The flowers are of delicate, but durable, texture and are most attractive. The fruits are small, yellow and drop rather early, but the graceful growth habit and delicate flowers make this variety unique. It is not yet available from commercial sources. Good specimens of "Blanche Ames" are growing on the Bussey grounds, and in the Arnold Arboretum on the bank just inside the Forest Hills gate.

A more recent hybrid apple appears so promising that it has been named before it has been thoroughly tested. It is a seedling from "Henrietta Crosby" and bears the Arnold Arboretum number 22957. The flowers are large — up to 1.5 inches in diameter — and are a brilliant red (Spinel red-0023/1). The fruits, which are about half an inch in diameter are bright red and hold their color and texture well into the winter. Although these trees are still young the spreading growth habit is already evident and the mature trees should possess a desirable form. This hybrid has been named "Henry F. duPont" in honor of a discriminating horticulturist who has long been a faithful member of the Arnold Arboretum's Visiting Committee. A small specimen of "Henry F. duPont" is on the Bussey bank inside the Forest Hills gate. It has been propagated for distribution, but will not be available to the public for at least several years.

Some of the most exciting apple hybrids have been obtained by using *Malus sargentii rosea* as the seed parent. The hybrids resemble *M. sargentii* in growth habit and in leaf shape, but some have much larger and more colorful flowers and larger fruits. One of the first of these hybrids, made by George Skirm in 1938, resembles *M. sargentii* in many respects but is more vigorous. The pink buds open into white blossoms in great abundance. The small fruits are a bright red, but do not last long since they are eaten by the birds and tend to drop early in the fall. This hybrid is a cross between *M. sargentii rosea* and *M. atrosanguinea* and since it is a daughter of *M. sargentii* it has been named "Mary Potter" for one of Professor Sargent's daughters. It has been distributed to the commercial growers and should soon be available from at least one nurseryman. Excellent specimens are on the Bussey grounds and on the bank inside the Forest Hills gate.

Two other promising new crab apple varieties have been introduced to the trade by the Arnold Arboretum. The first is "Katherine," originated as a seedling at Rochester Park by B. H. Slavin about 25 years ago. It has been named, at Mr. Slavin's request, in honor of his daughter-in-law Katherine Clark Slavin. *Malus spectabilis* is probably one of the parents. This variety has large flowers which are double, with about 20 petals. The white and pink blossoms are most attractive and the growth habit of the tree is quite good. There is some tendency for it to flower only in alternate years and the small yellow fruits are not outstanding. We have progeny of "Katherine" with attractive red fruits which are now being tested. Small specimens of "Katherine" may be found in the Arboretum on Peters Hill, and it is available from several nurserymen.

A spectacular variety of ornamental apple was found as a chance seedling by Dr. Donald Wyman on the Arboretum grounds. The flowers are white, deeply tinged with pink, with about 16 petals and are about 5 centimeters in diameter. The orange yellow fruits are about 1.5 centimeters in diameter and are most colorful in the fall. It flowers when only two or three years old and is an annual bearer. It was named in honor of Dr. Wyman's older daughter Dorothea. Small specimens of "Dorothea" may be seen on the Bussey grounds and on Peters Hill in the Arboretum. It is available from commercial sources.

The Magnolias are among our finest ornamental trees, particularly *M. stellata*, the Star Magnolia. Unfortunately it blooms so early in the spring that the flowers are often injured by cold weather. We have not yet been able to combine the small attractive growth habit and attractive flowers with a later blooming variety, but one of the *M. stellata* hybrids has proved to be outstanding for gardens where a relatively large specimen can be used. This hybrid, a cross between *M. stellata* and *M. kobus*, has been named the "Merrill" Magnolia, in honor of Dr. E. D. Merrill, former director of the Arnold Arboretum. It has flowers much like those of *M. stellata* and blooms early in the spring, but it is a symmetrical, vigorous tree and at the age of 15 years is larger than the 60-year-old *M. stellata* specimens near by. An excellent specimen is growing near the Administration building. It has been propagated and was offered for distribution by a large nursery last year.

The Forsythias herald spring in New England. They are tough, hardy, easy to grow and are spectacular in early spring, but most of the varieties have little to offer the rest of the year. In cold open winters the flower buds are often killed. We have tried to produce new compact hardy types using *Forsythia ovata*, one of the hardiest species, as one of the parents, but without much success to date.

In 1939, George Skirm produced a tetraploid seedling of *Forsythia intermedia spectabilis* which was named "Arnold Giant." The growth habit is rather stiff. The large deep yellow flowers are attractive, but are rather shy and do not turn their faces to the sun. The late Lord Aberconway grew some plants of "Arnold Giant" in England where it was given an award of merit by the Royal Horticultural Society, but in this country most people prefer the lighter colored flowers.



PLATE II

Magnolia loebneri "Merrill"—This hybrid, a cross between *M. stellata* and *M. kobus* is one of several meritorious ornamental plants that have been originated as a result of the plant breeding program of the Arnold Arboretum.

“Arnold Giant” is, however, an excellent variety for forcing as a cut flower, and as a parent in the production of triploid varieties.

“Arnold Dwarf” forsythia is an odd segregate from a cross between *F. intermedia* and *F. japonica saxatilis* made in 1942. It grows only a few feet tall and the spreading branches root readily in contact with the ground. Its compact spreading growth habit makes it a good ground cover. It has been slow in coming into flower and as yet the flowers have not been borne abundantly. Perhaps propagation from flowering plants will overcome the delay and paucity of flowering. Several collections of “Arnold Dwarf” are growing on the Bussey grounds and several specimens have been planted at the lower end of the forsythia collection in the Arboretum. It is available from some nurseries.

Considerable work has been done with the lilacs, to get a low-spreading type of bush with flowers like those of the *Vulgaris* lilacs, but with no success. The small-spreading species such as *Syringa microphylla* can not be crossed with the *Vulgaris* lilacs, and crosses between *Vulgaris* varieties and *S. laciniata* or *S. pinnatifolia* produce only sterile hybrids. The *vulgaris laciniata* hybrids produced in Europe have given us the “Chinese” lilacs which have the grace of the Chinese species, *S. laciniata*, in growth habit and inflorescence, and the flowers have been increased in size by the Balkan parent *S. vulgaris*. A number of new hybrids between these parental species have been grown, but none has yet been better than the older varieties of *S. chinensis*.

There are probably thousands of varieties of rhododendron, yet few of them are entirely happy in New England with the cold winters and hot summers. We have grown a number of hybrid segregates from crosses between the hardier Catawbiense varieties and the more tender but more attractive Fortunei hybrids. We have selected several dozen from among more than 500 segregates and they are being tested for hardiness and insect resistance on the Bussey grounds.

The artificial doubling of chromosomes has been a promising technique in producing new varieties of forsythia and other genera. In 1939, seedlings of *F. intermedia spectabilis* were treated with colchicine and produced a tetraploid plant. This was pollinated with pollen from nearby species, including *F. ovata*, and gave rise to several dozen triploids. Several of these had exceptionally large flowers—up to $2\frac{1}{2}$ " in diameter—and flowered freely. One was selected for propagation and has been named in honor of Beatrix Farrand, one of the leading landscape gardeners of this country and former student of Professor Sargent. The “Farrand” Forsythia has been distributed to a number of commercial growers.

The triploid forsythias are relatively sterile, but an occasional fertile seed is formed. These seeds often have an unbalanced chromosome number and produce aneuploid seedlings which are occasionally so unlike the mother plant that they hardly look like forsythias. Many of these aneuploid seedlings are dwarf types and should begin to flower this spring.

The progeny of triploids have also proved to be unique in *Philadelphus*. Several

of the most attractive varieties of mock oranges are triploids which originated in Europe from segregates of species hybrids. The variety "Bicolore" in the *Arbo-retum* produces some viable seed and we have grown more than a hundred progeny. They are extremely variable and may provide some unique segregates of horticultural interest.

Triploid magnolias are also being grown. An artificial tetraploid was produced in 1939, but was of no value because the petals were too thick to open properly. It was back-crossed to normal diploids to produce triploids. We have several dozen plants which are still in the nursery. They will be moved to the testing plots at the Case Estates in Weston in another year or two.

Other methods of producing new ornamental plants

It has long been known that the mutation rate in plants and animals could be greatly increased by exposure to X-rays or other ionizing radiation. Horticulturists in Sweden and in Canada have been able to increase the frequency of bud sports in apples by irradiating scions used in grafting. We have done some work along this line with a portable radiation source provided by the Brookhaven National Laboratories. We have also cooperated with this Laboratory by providing ornamental trees and shrubs which have been planted in the "gamma field" at Upton, Long Island. Various intensities of chronic irradiation are provided by planting the trees and shrubs at varying distances from the radioactive cobalt source in the center of the field. As these ornamentals reach the flowering stage they will be examined for desirable mutations or "bud sports."

Ionizing radiation from X-rays, radium or radioactive cobalt has also been used to stimulate plant growth, but with very few exceptions the experiments conducted in Europe and the United States have not shown any favorable results. We have, however, been able to induce earlier flowering in gladiolus by irradiating the corms with 3000 roentgens of X-rays. This experiment was conducted at the Bussey Institution and will be repeated this summer.

The need for smaller trees for the modern home and the home orchard has stimulated work on dwarfing techniques so that standard varieties of ornamental and fruit trees can be grown as dwarfs. For hundreds of years the European horticulturists have used special rootstocks to dwarf apples and pears. We have used *Prunus tomentosa* as a dwarfing stock for peaches and plums, and these dwarfed trees should soon be available from commercial sources. Some of the dwarf fruit trees are nice ornamentals and could serve a dual purpose.

Work is in progress to find suitable dwarfing stocks for standard ornamental trees. *Malus sargentii* and other species of apples are being tested as dwarfing stocks for ornamental crabs. Preliminary tests indicate that the Silver Maple when used as a rootstock dwarfs the Red Maple and the new "Crimson King" maple.

New techniques for dwarfing trees and inducing earlier flowering have been

developed at the Arnold Arboretum and the Bussey Institution during recent years. The inversion of a ring of bark on the trunk of a young tree has the same effect as girdling, but without the danger of killing or infecting the tree. The flow of elaborated sap down the bark is checked by inverting the bark because the phloem cells are "polarized"—they permit flow in only one direction. This operation is performed in June and preferably on trees several years old, although we have inverted the bark of an ornamental apple with a trunk diameter of about 5 inches. Perhaps one could let a tree reach the desired size and check further growth by inverting a ring of bark. These experiments are still in the preliminary stages, but if anyone is interested he can see this and the other experimental work on the Bussey Institution grounds adjacent to the Arnold Arboretum, where a demonstration dwarf orchard has been planted adjacent to the Bussey greenhouses.

KARL SAX

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Arnoldia
Arnold Arboretum
Jamaica Plain 30, Mass.

Please make checks payable to Harvard University.

FIELD CLASS

Registrations are still open for the Friday morning Field Class at the Arnold Arboretum which meets Fridays from 10-12 o'clock. The registration fee of \$2.00 can be sent to Dr. Carroll E. Wood, Jr., Arnold Arboretum, Jamaica Plain 30, Mass.

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VOLUME 15

APRIL 22, 1955

NUMBER 3

SPRING COMES TO THE ARBORETUM

EVERGREENS, especially the broad-leaved types have suffered considerable damage during the winter, and an unusual amount of burning of foliage has been noted in certain exposed situations. Fortunately, the rhododendrons in the Arnold Arboretum collection have not been nearly as badly damaged as have been the plants in some of the gardens in the Boston suburbs. There has been a small amount of twig die-back, which is always most difficult to explain, but by and large the rhododendrons in the Arboretum came through the winter in fine condition.

The past winter has been a comparatively mild one. The damage that has been done to plants was probably caused by the alternate freezing and thawing experienced in January and February, when temperature changes were rapid and extreme; also, damage may have been caused when the ground was frozen but sudden high temperatures on warm days brought about increased transpiration. Heavy snow and ice storms failed to materialize so that the plants in the Arboretum did not suffer damage from this often serious trouble.

In fact, a walk through the Arboretum now shows that most of the collections are in a surprisingly good condition. Although two hurricanes ripped through the plantings last fall, all but a few of the most remote trees blown over by those winds have been removed. As was stated then, the actual pruning off of broken branches will not be complete for a long time yet, although several men have been pruning throughout the winter on all but the coldest days.

Fertilizers are being applied this spring to many of the collections and to many of the plants injured by the storms last fall. Spraying, which each year becomes an increasingly complicated problem, is progressing normally and the new high pressure hydraulic sprayer is certainly facilitating matters. Certain plants are still sprayed by the "blower," but we are finding that we must depend on hydraulic spraying as well as mist spraying to successfully combat all the insects and diseases here.



The obvious evidence of spring came suddenly on April 11, after two extremely warm days brought several kinds of shrubs into bloom some several days in advance of the normal time they usually start to flower. The oriental witch-hazels were in bloom during the greater part of February and March and have now gone past. *Cornus mas* started into flower about April 5, as did *Rhododendron mucronulatum* and *Rhododendron dauricum sempervirens*. There does not seem to be much difference between the blooming dates of these two early blooming shrubs when they are growing side by side as they are in the new azalea border across from the Administration Building. The star magnolia and its hybrid, the new *Magnolia* "Merrill" came into full bloom very quickly on April 11. After two extremely warm days with rather brisk warm winds, these plants quickly put out their flowers in one day. It is interesting to note, that, as far as these plants in the Arboretum are concerned, no flower buds have been killed by the winter. Killing of these flower buds is usually brought about by extremely low temperatures, and the lowest recorded officially by the Boston Weather Bureau until February was 10° F. on January 28, truly a mild winter! In February, the temperature did dip below this on three days (Feb. 2, to 5°, Feb. 3, to -1°, and Feb. 13, to 9°). These three days were the only truly cold ones all winter!

Another indication of the mildness of the winter is the present condition of the *Corylopsis* species. Cold winter temperatures frequently kill these flower buds so that normally they do not produce good flowers more than one spring out of three. This year, they came into full bloom April 12, and showed a surprisingly small number of killed flower buds. However, because the yellow forsythias and Cornelian cherry both bloom at this same time, and give about the same effect at least from a distance, the more tender winter-hazels have not proved very popular in New England.

The red maples, elms, yews, and boxwoods all came into flower about the middle of April. The flowers of these are none too conspicuous but one is cognizant of their being in full bloom because of the activity of the bees about them, obtaining pollen to build strong spring broods. The native spice bush, too, bloomed at the same time. A nice clump of plants can be seen growing along the road opposite the lilac collection, and they produced many flowers this spring.

Another plant which frequently fails to bloom properly because of extremely low winter temperatures is the spring heath (*Erica carnea*). The planting of this is at the top of the bed of heathers by the Juniper collection, and these were covered with profuse flowers the week of April 10—far better in bloom than they have been for many years.

The single flowered oriental cherries came into bloom April 18. The large collection at Washington, D.C. was badly injured by unprecedented cold in late March, when they normally begin to flower there. This cold spell extended down into the Carolinas, Georgia, and Alabama, and did millions of dollars damage to fruit crops alone. Fortunately, the plants in New England were not sufficiently far advanced at the time to be injured.



PLATE III

Corylopsis spicata, the Spike Winter-hazel, has stiffly pendulous clusters of small yellow flowers at this time of year. It is not thoroughly hardy in the Boston area, but no flower buds were killed this past winter.

Each spring the Arboretum staff is questioned by hundreds of people concerning just when the lilacs are going to bloom, or which azalea will bloom the second week of May, or when do the rich red flowering rhododendrons begin to open their flowers. These dates naturally vary slightly from year to year. Also, the length of time the plants remain colorful depends on the weather at the time, a cool cloudy spell will result in their lasting much longer than during hot sunny weather. In the following list, a single plant may be listed because the planting at the Arboretum is conspicuous. On the other hand, the groups, such as hydrangeas and honeysuckles, include many species which bloom over a considerable time. One should not expect them all to bloom together, but rather separately and within the general limits listed. It will undoubtedly be of interest to many a possible Arboretum visitor and amateur photographer, to glance through the following list of dates when the more conspicuous plants are expected to bloom this year:

Amelanchiers	Late April-early May
Azaleas (American)	Mid-May-late June
Azaleas (Asiatic)	Mid-April-late May
Azaleas (Flame)	Mid-April-late May
Azaleas (Ghent Hybrid)	Late May
Azaleas (Torch)	Mid-May
Brooms	Early May-mid-May
Crabapples	Early May-late May
Dogwoods (Flowering)	Mid-May
Forsythias	Mid-April
Fothergillas	Mid-May
Hawthorns	Early May-mid-June
Honeysuckles	Mid-April-mid-June
Horsechestnuts	Mid-May
Hydrangea (Climbing)	Early June
Hydrangeas	Late June-August
Japanese Quinces	Early May
Lilacs—(Common)	Mid-late May
Lilacs (Preston Hybrid)	Early June
Magnolias	Late April-early June
Mock Oranges	Early June-mid-June
Mountain-Laurel	Mid-June
Oriental Cherries	Late April-early May
Oriental Witch-hazels	March
Rhododendrons	Early June-mid-June
Rose-of-Sharon	August
Rose species	Late May-Mid-June
Siberian Pea Trees	Mid-May
Spiraeas	Late April-mid-June
Viburnums	Mid-May-mid-June
Weigelas	Mid-May-mid-June

DONALD WYMAN

ARNOLDIA



A continuation of the BULLETIN OF POPULAR INFORMATION of the Arnold Arboretum, Harvard University

VOLUME 15

MAY 13, 1955

NUMBER 4

THE ARBORETUM LILACS IN THEIR ORDER OF BLOOM

THERE are at least five full weeks of lilac blooms at the Arnold Arboretum. This is not known to every Arboretum visitor, since to the majority, lilacs bloom only during a ten-day period in late May. It is true that the largest display comes at this time, since three fourths of the lilac collection consists of *Syringa vulgaris* varieties. But it is still true that there is a continuous display of lilac blooms for a five-week period at least, and sometimes this is extended for another week or two if weather conditions remain favorable.

When some of the species are compared with the many beautiful varieties of *S. vulgaris*, they are found lacking in color, fragrance and size; but when the *S. vulgaris* varieties are not in flower for comparison, these species and their comparatively few varieties are of interest and contain several plants well worth including in many garden plantings. It should be noted here that the excellent survey "Lilacs for America" first published in 1941 and rewritten and published in October 1953, is now available from most of the major Arboretums of the United States. This was an intensive study of all lilacs grown now in America, notes on color and origin together with actual sources where each variety is being grown and where each variety can be purchased. Much of the information in this issue of *Arnoldia* is taken from this extensive survey.

The Arboretum lilacs are listed according to the times at which they start to bloom. Frequently they may remain in bloom sufficiently long so that they can be used ornamentally with lilacs in another group. Thus, *S. chinensis* and *S. persica* come into bloom after the *S. vulgaris* varieties have reached their peak, but still can be used at the same time effectively. As is the case with the sequence of bloom of other ornamental trees and shrubs, weather conditions may alter the dates. However, after comparing the records based on the lilac collection at the Arnold Arboretum for several years, we find that the following groups of species and their varieties bloom together.

[17]



LILAC SEQUENCE OF BLOOM

Group 1	
Blooming about May 10	Common Name
<i>S. oblata</i> and varieties	Early Lilac
<i>hyacinthiflora</i>	Hyacinth Lilac
<i>pinnatifolia</i>	Pinnate Lilac
Group 2	
Blooming about May 20	
<i>S. chinensis</i> and varieties	Chinese Lilac
<i>julianae</i>	Juliana Lilac
<i>laciniata</i>	Cutleaf Lilac
<i>meyeri</i>	Meyer Lilac
<i>microphylla</i>	Littleleaf Lilac
<i>persica</i>	Persian Lilac
<i>potanini</i>	Potanin Lilac
<i>pubescens</i>	Hairy Lilac
<i>velutina</i>	Manchurian Lilac
<i>vulgaris</i> and varieties	Common Lilac
Group 3	
Blooming about June 5	
<i>S. emodi</i>	Himalayan Lilac
<i>henryi</i> and varieties	Henry Lilac
<i>josikaea</i> and varieties	Hungarian Lilac
<i>komarowi</i>	Komarof Lilac
<i>prestoniae</i> and varieties	Preston Lilac
<i>reflexa</i>	Nodding Lilac
<i>swegiflexa</i>	Swegiflexa Lilac
<i>sweginzowi</i>	Chengtu Lilac
<i>tomentella</i>	Felty Lilac
<i>villosa</i>	Late Lilac
<i>wolfi</i>	Wolfs Lilac
<i>yunnanensis</i>	Yunnan Lilac
Group 4	
Blooming about June 15	
<i>S. amurensis</i>	Amur Lilac
<i>amurensis japonica</i>	Japanese Tree Lilac
<i>pekinensis</i>	Pekin Lilac

Not all the lilacs listed are of outstanding ornamental value, and not all are available in the trade in this country. It may be of value to *Arnoldia* readers, if a few in each group are pointed out as being good ornamental additions to garden plantings.



PLATE IV

The Late Lilac (*Syringa villosa*) blooms about June 5 after most of the *S. vulgaris* varieties have faded.

Group 1. The early lilac, *S. oblata*, comes from northern China and is valued because it is the first of all the lilacs to bloom and also because it is the only lilac with a red to orange autumn color. Unfortunately, there are times when the flower buds are injured by severe winters. The leaves are rarely disfigured by the mildew so evident on the common lilac in late summer. The variety *dilatata* is perhaps the best because of its large lilac-pink flower clusters.

There are several varieties of *S. hyacinthiflora* chiefly originated in France as a result of Victor Lemoine's hybridization at Nancy, France, and are of an intermediate lavender color. The varieties "Turgot" and "Necker" are probably the most prominent of the group. However, all the varieties of *S. hyacinthiflora* can be used for ornamental planting since they bloom slightly in advance of *S. vulgaris* and as a rule form larger growing and more vigorous shrubs. *S. pinnatifolia* is the least ornamental of any lilacs here listed.

Group 2. The Arboretum collection contains over 300 varieties of the common lilac. The better varieties selected as a result of the Lilac Survey of 1953, are listed in the following pages, mostly according to their popularity by the individuals who judged them.

This group of lilacs begins to bloom at the time the common lilac varieties are at their best. Both the Chinese and the Persian lilacs are valued for their lower habit of growth and for the larger number of blooms produced every year. Frequently the varieties of the common lilac tend to bloom well one year but have comparatively few blossoms the year following. These two species, however, bloom profusely every year and so are particularly good for cutting purposes. Of the Chinese lilac varieties, *saugeana* is possibly the best because of its deep pink flowers. The cutleaf lilac (*laciniata*) is also of value because of the feathery texture of its small lobed leaves. The hairy lilac (*S. pubescens*) is important because it is considered to be the most fragrant of all the lilacs, but the flowers are not as beautiful as those of the Chinese or Persian lilac, or, in fact, those of most of the common lilac varieties.

Group 3. Probably the best known of the varieties of *S. henryi* is "Lutèce," noted for its large pale purple flower clusters which are not fragrant. This variety and the others in Group 3 are important for they bloom at a time when all the flowers of *S. vulgaris* varieties have faded. The variety "Lutèce" grows vigorously and is available from many nurseries.

The late lilac, *S. villosa*, is common in gardens, and justly so, because of its many creamy-white flower clusters and good dense habit of growth.

Two hybrids are well worth growing, both being the result of Miss Isabella Preston's work at Ottawa, Canada. *Syringa prestoniae* named by Mrs. McKelvey, in honor of Miss Preston, is a group of hybrids, the flowers of which contain a great deal of pink. Most of the lilacs blooming in early June have white flowers,

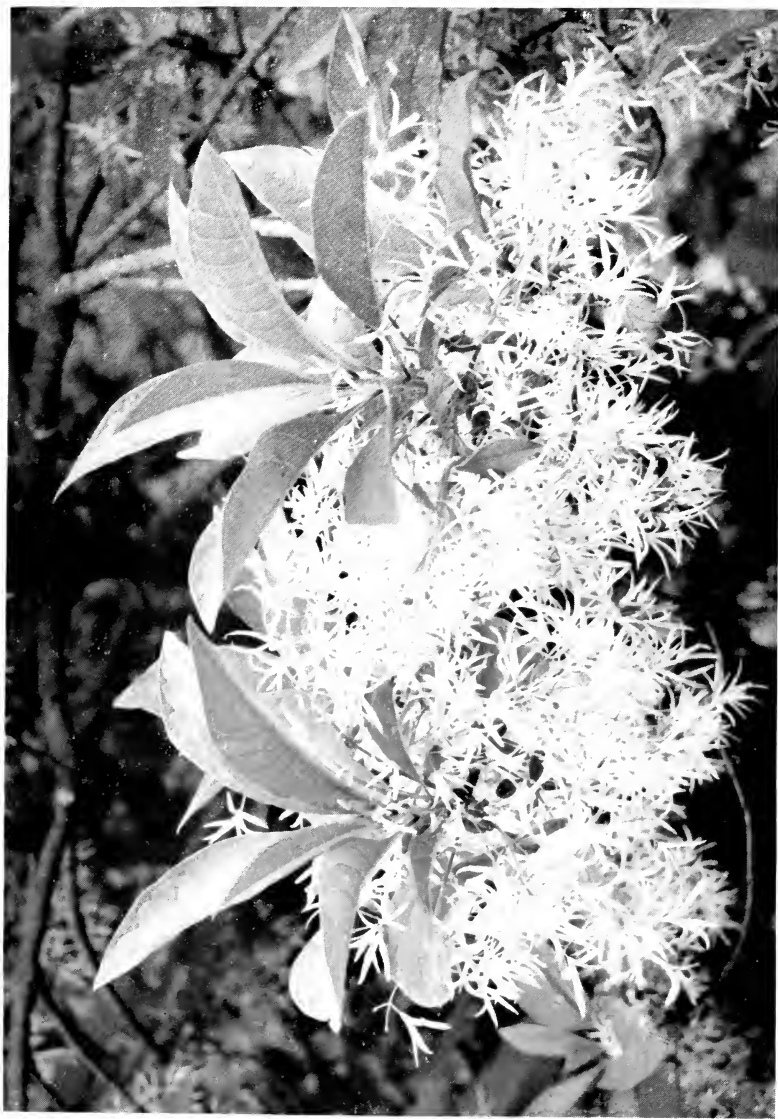


PLATE V

The flowers of the Fringe-tree (*Chionanthus virginicus*) appear in early June. It is a close relative of the lilac and a native from New Jersey to Florida but hardy into southern Maine. This interesting ornamental plant is one of the last to produce leaves in the spring.

but, because the pink flowering *S. reflexa* is one parent, *S. prestoniae* varieties are predominantly pink. This whole group is very important because the plants retain the vigorous growing qualities of *S. villosa* and some of the good color of *S. reflexa*. *Syringa reflexa* at the Arboretum has not proved a good shrub, though the individual flowers are very beautiful; but Miss Preston's hybrids are well worth growing in the United States. The second hybrid group has been named *S. swegiflexa*. At the Arboretum, our plants are small, but at Ottawa larger plants are growing and clearly show that nurserymen in the United States would do well to grow at least a few of these varieties for their late flowers.

Group 4. The last of the lilacs is the largest growing of all—the Japanese tree lilac. This was formerly considered to be a separate species (and is listed by most nurserymen as *S. japonica*), but it is now considered to be a variety of *S. amurensis*. It forms a single trunk and has very conspicuous large creamy-white flower clusters in mid-June. The bark is distinctly ornamental for it is very similar to that of *Prunus avium*. Where it is given sufficient space in which to expand, it develops into the most prominent of all lilacs.

SOME OF THE BEST HYBRID LILACS LISTED IN THEIR RESPECTIVE GROUPS IN THE ORDER OF THEIR POPULARITY

(s=flowers single d=flowers double) (date is the date of origin)

Some Good Early Hybrids

s	"Necker" (1921) pink	s	"Assessippi" (1936) lilac
s	"Lamartine" (1911) pink	s	"Catinat" (1923) pink
s	"Pocahontas" (1935) purple	s	"Buffon" (1921) pink
s	"Louvois" (1921) violet	s	"Esther Staley" (1948) magenta
s	"Montesquieu" (1926) magenta	s	"Blue Hyacinth" (1943) blue

SYRINGA VULGARIS VARIETIES

(Blooming in Mid Season)

I (White)

s	"Vestale" (1910)	d	"Ellen Willmott" (1903)
s	"Mont Blanc" (1915)	d	"Edith Cavell" (1916)
s	"Jan Van Tol" (1916)	d	"Mme. Lemoine" (1890)
s	"Mme. Florent Stepman" (1908)	d	"Jeanne d'Arc" (1902)

II (Violet)

s	"De Miribel" (1903)	d	"Marechal Lannes" (1910)
s	"Cavour" (1910)	d	"Violetta" (1916)

III (Blue to Bluish)

s	"President Lincoln" (1924)	d	"Olivier de Serres" (1909)
s	"Decaisne" (1910)	d	"President Grevy" (1886)
s	"Maurice Barres" (1917)	d	"Duc De Massa" (1905)
s	"Firmament" (1932)	d	"Emile Gentil" (1915)

IV (Lilac)

s	"Jacques Callot" (1876)	d	"Leon Gambetta" (1907)
s	"Cristophe Colomb" (1905)	d	"President Fallieres" (1911)
d	"Victor Lemoine" (1906)	d	"Henri Martin" (1912)

V (Pink and Pinkish)

s	"Lucie Baltet" (1888)	d	"Mme. A. Buchner" (1905)
s	"Macrostachya" (1844)	d	"Montaigne" (1907)
d	"Katherine Havemeyer" (1922)	d	"Belle De Nancy" (1891)

VI (Magenta)

s	"Congo" (1896)	d	"Paul Thirion" (1915)
s	"Capitaine Baltet" (1919)	d	"Mrs. Edward Harding" (1923)
s	"Mme. F. Morel" (1892)	d	"Paul Deschanel" (1924)
s	"Marechal Foch" (1924)	d	"Charles Joly" (1896)

VII (Purple and Deep Purple)

s	"Ludwig Spaeth" (1888)	s	"Diderot" (1915)
s	"Monge" (1913)	d	"Adelaide Dunbar" (1924)
s	"Mrs. W. E. Marshall" (1924)	d	"Paul Hariot" (1902)

Some Good *Late Hybrids*

(Blooming after June 5)

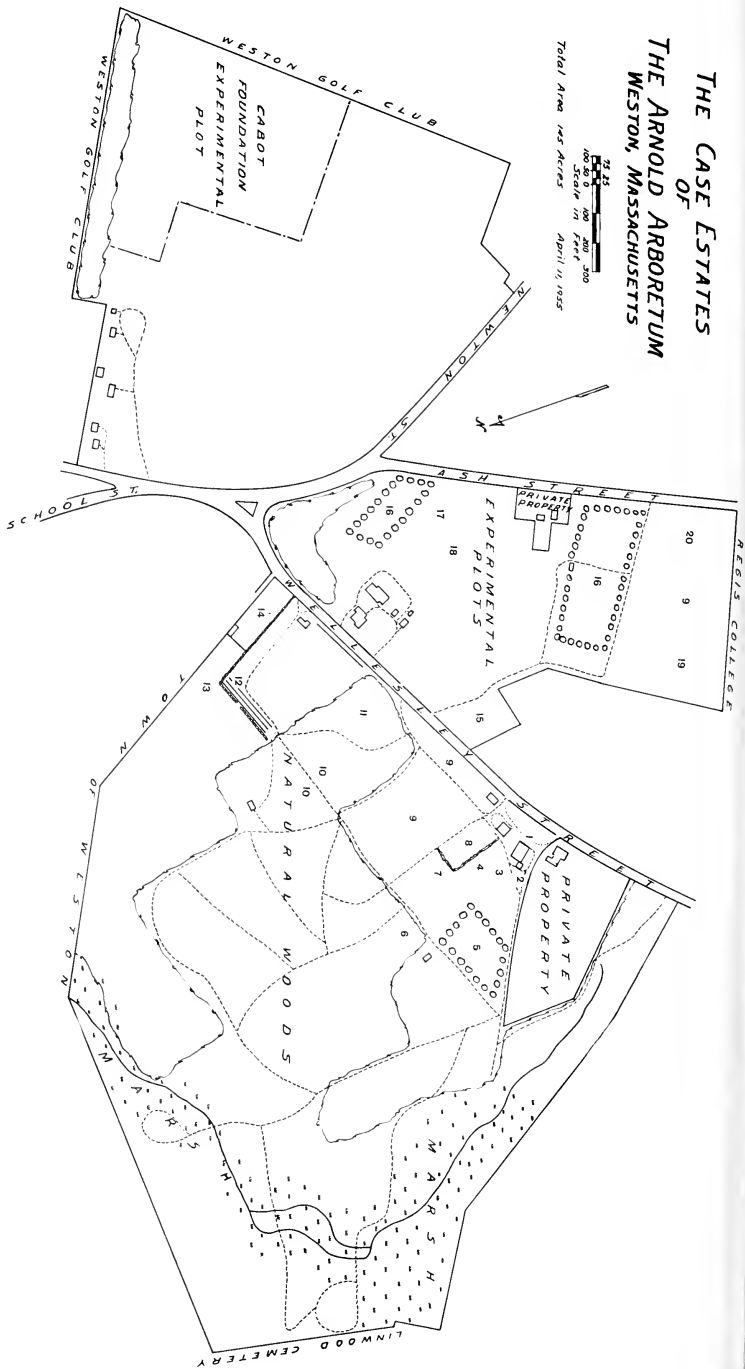
s	henryi	"Lutèce" (1900) (pale violet and pink)
s		"Prairial" (1933) (fuschia purple)
s	josiflexa	"Enid" (1927) (cyclamen purple)
s		"Lynette" (1927) (rhodamine pink)
s	prestoniae	"Ariel" (1927) (petunia purple)
s		"Coral" (1927) (rhodamine pink)
s		"Dawn" (1927) " "
s		"Hecla" (1927) " "
s		"Hiawatha" (1927) " "
s		"Isabella" (1927) (fuschia purple)
s		"Miranda" (1927) " "
s		"Nerissa" (1927) (cyclamen purple)
s		"Romeo" (1927) (rhodamine pink)
s		"Ursula" (1927) (fuschia purple)

DONALD WYMAN

NOTE: An Open House was held at the Case Estates of the Arnold Arboretum on May 7 and 8, and several hundred visited the grounds at that time. These are always open to visitors and a detailed Map of the grounds is on the last page of this bulletin. It is here that the Arboretum maintains permanent and nursery plantings and conducts a portion of its experimental program in horticulture.

THE CASE ESTATES OF THE ARNOLD ARBORETUM WESTON, MASSACHUSETTS

Total Area 148 Acres
Scale 1" = 100 Feet
April 14, 1925



1. Barn, 135 Wellesley Street
 2. Greenhouse
 3. Cold Frames
 4. Young Plant House
 5. *Malus sikimensis* Orchard
 6. Holly Collection
 7. Evergreen Nursery
 8. Ericaceous Nursery
 9. Nursery
 10. Woods Path
 11. *Rhododendrons*
 12. *Wisteria* Experiment
 13. Small Street Trees
 14. Ground Cover Demonstration Plots
 15. Perennial and Small Shrub Garden
 16. Orchard
 17. Beach Plum Collection
 18. Dwarf Fruit Trees
 19. Permanent Barberry and Currant Collection
 20. Permanent Shrub Testing Plot.
- The Case Estates of the Arnold Arboretum are situated in the Town of Weston on both sides of Wellesley Street, between the major Massachusetts highways Route 20 and Route 30.

ARNOLDIA



A continuation of the BULLETIN OF POPULAR INFORMATION of the Arnold Arboretum, Harvard University

VOLUME 15

JUNE 24, 1955

NUMBERS 5-7

A REVISED GLOSSARY OF THE MORE COMMON BOTANICAL AND HORTICULTURAL TERMS

AS a result of frequent requests this revised edition of the glossary of horticultural terms, first published fifteen years ago in the BULLETIN OF POPULAR INFORMATION has been prepared. This glossary is a selective compilation of the more common technical terms used in horticultural literature and is recorded here as an aid to both horticulturists and amateur gardeners who do not have ready access to the many well prepared glossaries already in existence. Several of my colleagues have contributed considerably by suggesting many additional terms which are appearing more frequently in current horticultural literature and in the revised definition of some of the terms as used in the original edition of this glossary. The works of many authors have been utilized, among them L. H. Bailey, A. Gray, Fuller and Tippo, B. D. Jackson, Jepson, Mayr and Simpson, G. H. M. Lawrence, A. Rehder, et al.

abaxial the side of an organ away from the axis; dorsal.

aberrant differing from usual structure, departing from the type; used mostly of variation.

abortive barren; imperfectly or not developed; as abortive stamens when only filaments are present.

acaulescent stemless; as in the dandelion.

achene a small, dry, indehiscent, one-celled and one-seeded fruit; as in the buttercup.

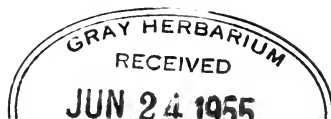
actinomorphic having flowers with a regular pattern; symmetrical.

acuminate having a gradually diminishing point; long pointed.

adaxial the side of an organ toward the axis; ventral.

adnate grown to, united to another part; stamens adnate to the corolla-tube.

adventitious buds those produced abnormally, as from the stem instead of the axils of the leaves.



adventive applied to an introduced plant, not definitely established or naturalized.

alate winged; furnished with an expansion, as found on the stem or petiole.

allopolyploid a polyploid in which at least one set of chromosomes is derived from an unrelated taxon.

ament a catkin; a spike of flowers usually bracteate and frequently deciduous, as the male flowers of willow, birch, beech and oak.

amphidiploid a type of polyploid characterized by the addition of both sets of chromosomes from each of two species.

amphiploid see **amphidiploid**.

anastomosed netted; leaves in which the cross veins form a net.

androecium the male or stamen-bearing part of the flower. See also **gynoecium**.

aneuploid having a chromosome number which is not an exact multiple of the haploid number.

angiosperms plants having their seeds enclosed in an ovary. See also **gymnosperms**.

anther the pollen-bearing part of the flower.

anthesis flowering; strictly the time of expansion of a flower; often used to designate the flowering period.

anthocyanins blue, red and purple water-soluble pigments of plants.

apetalous without petals; as in willows.

apomictic hybrid hybrid which can be reproduced true to type from seed, which develops without fertilization.

appressed lying flat and close against.

arborescent attaining the size or habit of a tree.

articulate jointed; having a node or joint where separation may take place naturally.

asexual without sex; destitute of male or female organs;
asexual reproduction reproduction vegetatively; without the aid of sexual organs.

attenuate tapering slenderly; applied usually to the apex of a leaf.

atypical not typical; departing from the normal.

auriculate furnished with ear-shaped appendages (auricles), as the base of a petal or leaf.

autoploid see **autopolyploid**.

autopolyploid a polyploid originating by the multiplication of the chromosome set of an individual.

auxin a specific organic product transported in the sap of a plant producing a specific effect on the growth activities of the cells.

awl-shaped tapering from the base to a slender or stiff point.

awn a bristle-like appendage.

axil the upper angle formed by a leaf or branch with the stem.

axillary situated in the axil.

B

- baccate** berry-like; pulpy or fleshy; as in the gooseberry.
- barb** hooked hair, frequently doubly hooked.
- barbellate** finely barbed.
- basifixed** attached or fixed by the base.
- beaked** ending in a beak or prolonged tip.
- bearded** furnished with a tuft of hairs.
- berry** an indehiscent fruit developing from a single ovary, having few to many seeds and a fleshy or pulpy outer wall; as the tomato or gooseberry. See also **drupe** and **pome**.
- bi** or **bis** Latin prefix signifying two or twice.
- bicolored** two-colored.
- biennial** a plant which requires two years to complete its life-cycle; as the hollyhock.
- bifid** two cleft.
- bifoliate** a leaf composed of two leaflets.
- bigener (bigeneric hybrid)** plant hybrid resulting from a cross between two genera.
- bilabiate** two-lipped; as in flowers of *Salvia*.
- bilocular** two-celled.
- binomial** the combination of a generic and specific name to denote a given organism; as *Acer rubrum*.
- biotype** an elementary stable form.
- bipinnate** twice pinnate; when the divisions of a pinnate leaf are again pinnately divided.
- bisexual** having both stamens and pistils.
- blade** the expanded portion of a leaf.
- bloom** (1) see blossom. (2) The white waxy or pruinose covering of many fruits and leaves.
- blossom** the flower, more often applied to those of fruit trees.
- bole** the trunk or stem of a tree.
- bract** a much reduced leaf, particularly the small or scale-like leaves in a flower-cluster or associated with the flowers.
- bracteate** having bracts.
- bracteolate** having bractlets.
- bractlet** bract borne on a secondary axis, as on the pedicel.
- breed** a group of plants having distinctive qualities in common, which, developed through the influence of man, requires control by man to prevent mixtures with other groups; does not imply directly traceable descent from any particular plant and may be propagated from seed.
- bristle** stiff hair.
- bud** the nascent state of a flower, leaf or branch.

bud mutation an abnormal shoot (caused by genetic change), which can be propagated only asexually.
bud-scale covering of a bud.
bud-sport same as bud-mutation.
bud-variation same as bud-mutation.
bulb a modified bud with fleshy scales, usually underground.
bulbil a diminutive bulb.
bullate blistered or puckered; as the leaf in Savoy cabbage.
bush a low, several- to many-stemmed shrub, without distinct trunk.

C

caducous falling off early.
callus a hard prominence or protuberance; in a cutting or on a severed or injured part, the roll of new covering tissue.
calyx the outer perianth of the flower; the collective term for sepals.
cambium the layer of delicate, rapidly dividing cells that form wood internally and bark externally.
campanulate bell-shaped.
canescent gray-pubescent and hoary.
capitate head-like; collected in a dense cluster.
capsule a dry fruit of more than one carpel, opening at maturity.
carinate keeled.
carpel a simple pistil or a member of a compound pistil.
catkin a deciduous spike of unisexual, apetalous flowers. See **ament**.
caudate having a slender, tail-like appendage.
caudex the main axis of a plant, including both stem and root.
caulescent more or less stem-bearing; having an evident stem above ground.
cauline belonging to the stem, as cauline leaves.
cell one of the minute compartments or living units of protoplasm of which plants are composed or made up; also a cavity of an anther or ovary.
cespitose (or **caespitose**) growing in tufts; forming mats.
channeled deeply grooved longitudinally.
chartaceous having the texture of stiff writing paper.
chlorophyll the green coloring matter within the cells of plants.
choripetalous having separate petals: polypetalous. See also **gamopetalous**.
chromosomes chromatin threads bearing hereditary determiners (genes) in the nuclei of cells; chromosomes contract by coiling at the time of cell division and are visible as rod-like masses.
ciliate fringed with hairs.
ciliolate minutely ciliate.
cinereous ash-colored, light gray.
circumscissile opening or dehiscing by a regular transverse line of division.
clavate club-shaped; said of a long body thickened toward one end.

cleistogamous closed self-fertilized flowers; as in some violets.

clone a group of plants composed of individuals produced vegetatively from a single original plant; clones differ from races and strains in failing to come true from seeds; examples: Concord grape, Baldwin apple.

coalescence the union of similar parts or organs, or of those in the same series as stamens with stamens and petals with petals.

coalescent two or more similar parts united.

colchicine a poisonous alkaloid; used experimentally and commercially to produce new plant varieties (polyploids) when applied to mitotic cells.

columnar having the shape of a column.

compost a fertilizing mixture composed of such substances as peat, leaf mold, manure, lime, etc., thoroughly mixed for fertilizing and renovating land; usually decomposed in a pile with top soil as a compost heap.

compound of two or more similar parts united into one whole;
compound-leaf one divided into separate leaflets.

cone the fruit of such plants as fir, pine and spruce.

conifer cone bearing (not synonymous with evergreen).

connate joined in one organ.

connective the portion of the stamen which connects the sac of the anther.

cordate heart-shaped; usually referring to the base of the leaf.

coriaceous leathery.

corolla the inner series of floral envelopes consisting either of connate or distinct petals.

corm the enlarged fleshy base of a stem, bulb-like but solid, as in gladiolus.

corymb a flat-topped or convex flowering cluster with the outer flowers opening first. See also **cyme**.

costa a rib; the midrib or middle-nerve of a leaf.

cotyledon the primary leaf or leaves in the embryo.

creeper a trailing shoot that produces roots at intervals.

crenate toothed with rounded, shallow teeth.

cross hybrid of any description.

cross-fertilization fertilization secured by pollen from the flower of another plant.

cross-pollination transfer of the pollen of one flower to the pistil of another.

crustaceous having a hard or brittle covering.

culm the stem of grasses and sedges.

cultigen a plant, group, or series known only in cultivation. See also **indigen**.

cultivar so-called "horticultural variety" or "garden variety." Progeny of a clone, chimera, or the result of selective hybridization, which is known only in cultivation and may or may not be reproduced from seed. The name, usually selected by the propagator, appended to either a generic name or a binomial, should be set off by different type or included within quotations to distinguish it from the binomial of a natural species. Examples: *Syringa* Congo or *Syringa* **Congo**; *Malus* "Bob White"; *Deutzia scabra* "Pride of Rochester."

cuneate wedge-shaped; triangular with narrow end at point of attachment.
cupular cup-like or cup-shaped.
cupule cup of such fruits as the acorn.
cuspidate sharp-pointed.
cutting a severed vegetative or asexual part of a plant used in propagation; as a cutting of root, of stem, or of leaf.
cyme a convex or flat flower-cluster with the central flowers opening first. See also **corymb**.
cymose arranged in cymes; cyme-like.
cytology the branch of biology which treats of cells, especially of their internal structure.

D

damping off collapse of seedlings usually ascribed to the attack of fungi.
deciduous falling, not persistent, as the leaves of non-evergreen trees.
decompound more than once compound.
decumbent reclining or lying on the ground but with the ends ascending.
decurrent (leaf) extending down the stem below the insertion.
decussate opposite leaves in four rows up and down the stem; alternating in pairs at right angles.
defoliation the casting or falling off of leaves.
dehiscence the method or process of opening of a seed-pod or anther. See also **indehiscent**.
deltoid triangular; delta-like.
dentate with more or less spreading teeth.
di, dis Greek prefix signifying two or twice.
diadelphous in two groups, as the stamens of some *Leguminosae*, joined by their filaments.
diandrous with two stamens.
dichotomous forked regularly in pairs.
dicotyledons (dicots) plants having two cotyledons or seed lobes. See also **monocotyledons**.
die-back to die down; generally applied to the apex of the shoot system.
diffuse loosely or widely spreading.
digitate with the members rising at one point.
dimorphous occurring in two forms.
dioecious staminate and pistillate flowers on different plants. See also **monoecious**.
diploid an organism with a chromosome number double that of the haploid generation; the $2n$ generation.
dissected divided into many narrow segments.
dissipiment a partition in an ovary or fruit.
distichous disposed in two vertical ranks, as the florets in many grasses.

divaricate spreading, widely divergent.

divided separated to the base.

dormant restive or non vegetative; applied to buds or other parts of a plant in winter, or to the plant itself.

dorsal relating to the back or outer surface of an organ.

double (flowers) when the number of petals is increased at the expense of other organs, especially the stamens.

drupe a fleshy indehiscent fruit with a bony, usually one-seeded endocarp; like the cherry or peach.

E

e or **ex** Latin prefix usually denoting parts are missing, as **ebracteate** or **exstipulate** meaning without bracts or without stipules.

ellipsoid a solid body, elliptic in section.

elliptic a flat part or body that is oval and narrowed to rounded ends.

emarginate with a shallow notch at the apex.

embryo the rudimentary plantlet within the seed.

endemic native or local.

entire without toothing or division; with an even margin.

epi prefix meaning upon, such as epiphyte.

epigynous borne on the top of the ovary. See also **hypogynous** and **perigynous**.

epiphytic growing on other plants but not parasitic.

ericoid of leaves which are like those of heaths.

escape a cultivated plant found growing as though wild, dispersed by some agency.

espalier a fruit tree trained lattice-fashion in one plane.

euploid having a chromosome number which is a multiple of the haploid number.

evanescent soon disappearing, lasting only a short time.

evergreen remaining green throughout the year as pines and some rhododendrons. Does not necessarily refer to cone-bearing plants. See also **deciduous**.

excurrent with a projecting tip, as the nerve of a leaf projecting beyond the margin; the trunk of a tree with undivided main stem, as in the fir.

exfoliating peeling off in thin layers; as the bark of the birch.

exotic foreign, not native.

exserted prolonged beyond the surrounding organs, as stamens from the corolla.

exsiccatae dried, pressed specimens.

exstipulate without stipules.

eye the marked center of a flower; a bud on a tuber, as on the potato; a single-bud cutting.

F

F₁ first generation of a cross between species or varieties; often cultivated for the hybrid vigor; succeeding filial generations are designated **F₂**, **F₃**, etc.

falcate sickle-shaped.

- fasciated** an abnormal widening and flattening of the stem or branches.
- fascicle** a dense cluster.
- fastigate** with close and erect branches, as in the Lombardy poplar.
- ferrugineous** rust-colored.
- fertile** capable of producing fruit and seeds; also said of pollen-bearing anthers.
- fertilization** effect of pollen deposited on a stigmatic surface resulting in conversion of flower into fruit and of ovule into seed; the union of egg and sperm.
- filament** stalk of the anther.
- filiform** thread-like; long and very slender.
- fimbriate** fringed.
- flaccid** not rigid; lax and weak.
- floccose** clothed with tufts of soft hair or wool.
- florets** small individual flowers of compact heads or spikes.
- floriferous** flower-bearing, usually in the sense of abundantly flowering.
- foliaceous** leaf-like in texture or appearance; said particularly of sepals and calyx-lobes and of bracts that in texture, size or color look like small or large leaves.
- foliate** in combinations, -leaved; having leaves; as tri-foliate, *three-leaved*, as the stem of trillium. Often confused with trifoliate.
- foliolate** having leaflets; as trifoliate, *of three leaflets*.
- follicle** dry, dehiscent pericarp opening only along one suture; as the milk weed or peony.
- form** sub-division of a variety or species usually differing in one character and usually perpetuated vegetatively.
- frond** leaf of a fern; sometimes used in the sense of foliage.
- fructiferous** producing or bearing fruit.
- fructification** the act or process of fruiting; also the fruiting organ.
- fruit** the seed-bearing product of a plant.
- frutescent** nearly shrubby.
- fruticose** shrubby; with woody persistent stems and branches.
- fugacious** falling or withering away very early.
- funnelform** said of a corolla with the tube gradually widening upward; as in the morning-glory.
- furrowed** with longitudinal channels or grooves.
- fusiform** spindle-shaped; narrowed toward both ends from a swollen middle; as in the roots of the dahlia.

G

- gamopetalous** having the petals more or less united. See also **choripetalous** and **polypetalous**.
- gamosepalous** calyx of one piece; sepals united.
- geniculate** bent abruptly like a knee.
- genus** (pl. **genera**) a group of allied species under a single heading; or consisting of an isolated species exhibiting unusual differentiation (monotypic genus).

- germination** the development of the plantlet from the seed.
- girdle (to)** restrict or remove bark around the stem or other parts of plants.
- girdling roots** encircling roots at or below the surface of the ground which tend to strangle the plant.
- glabrate** nearly glabrous or becoming glabrous with age.
- glabrous** not hairy.
- gladiate** sword-shaped or sword-like.
- gland** a definite secreting structure on the surface embedded in or ending a hair; also any protuberance of the like nature which may not secrete, as the warty swellings at the base of the leaf in the cherry and peach.
- glandular** bearing glands or gland-like appendages.
- glaucous** covered with a bloom; bluish white or bluish gray.
- glochidiate** barbed; tipped with barbs.
- glomerate** in compact clusters.
- glume** a chaff-like bract; particularly one of two empty bracts at the base of the spikelet in grasses.
- gourd** a fleshy one-celled many-seeded fruit; like the melon.
- graft** a branch or bud inserted on another plant with the intention that it will grow there; a scion.
- graft-hybrid** plant showing influences of scion and stock caused by mechanical union of the tissues.
- grafting** the process of inserting a scion in a plant (stock) with the intention that the tissues of both shall unite and that the stock shall furnish the nourishment for the growth of the scion.
- granular, granulose** composed of or appearing as covered by minute grains.
- gymno** in Greek compounds, signifying naked or not covered.
- gymnosperms** plants with uncovered ovules, as the conifers. See also **angiosperms**.
- gynoecium** the female or pistil-bearing part of the flower. See also **androecium**.

H

- habit** the general aspect of a plant, or its mode of growth.
- habitat** the type of locality in which a plant grows.
- haploid** an organism with a single set of chromosomes (the *n* generation).
- hastate** halberd-shaped; like an arrowhead but with the basal lobes pointing outward nearly at right angles.
- head** a dense cluster or short, dense spike of sessile or nearly sessile flowers.
- heartwood** the innermost and oldest wood next to the pith, usually of a dark color.
- heel** an enlarged or more or less transverse part on the lower end of a cutting secured from the older or larger branch from which the cutting is taken.
- heliotropism** the characteristic of turning toward the light.
- herb** a plant not woody, at least above ground.

herbaceous of the texture of an herb; not woody.

herbarium a collection of dried specimens of plants with data, often mounted on linen paper, preserved for study or comparison.

heterogen group of plants heterozygous from hybridity or mutation among which there are several phenotypes. Individuals here may be propagated as clones, or cultivars may be segregated by selective breeding. Example: Japanese azalea.

heteromorphous parts of different shape.

heterophyllous with two sorts of leaves.

hip the fruit of the rose.

hirsute with rather coarse or stiff hairs.

hirtellous minutely hirsute.

hispid beset with rigid hairs or bristles.

hispidulous diminutive of hispid.

homo in Greek compound, all alike or of one sort.

homogamous bearing only one kind of flowers.

hormone see **auxin**.

horny hard and dense in texture.

host a plant which nourishes a parasite.

humus decomposing organic matter in the soil.

humus soils garden soils enriched with organic manure.

hyaline transparent or nearly so.

hybrid a plant resulting from a cross between two or more parents that are more or less unlike.

hybridization (1) the art of obtaining hybrids by artificial crossing; (2) also used for the same operation occurring naturally.

hydrophytes water plants, partially or wholly immersed.

hygrophytes marsh plants, or plants which need a large supply of moisture for growth.

hypanthium the cup-shaped or tubular receptacle on which the perianth and the stamens are inserted; as in the flower of the cherry.

hypogynous borne on the receptacle beneath the ovary; said of stamens and petals. See also **epigynous** and **perigynous**.

I

imbricate overlapping, as shingles on a roof; as the bud-scales of horse-chestnuts and azaleas.

impari-pinnate pinnate with a single leaflet at the apex; odd-pinnate. See also **pari-pinnate**.

imperfect flower having either stamens or pistils, but not both. See also **perfect flower**.

inarching grafting by approach, the scion remaining attached to its parent until union has taken place.

incanescens hoary or gray-pubescent.

- incised** cut sharply in the margin.
- indehiscent** not opening by valves or along regular lines. See also **dehiscent**.
- indigen** a plant of known origin growing spontaneously or in cultivation. See also **cultigen**.
- indigenous** original to the country, not introduced.
- indumentum** any covering, as hairiness.
- inferior ovary** one that is below the perianth. See also **superior ovary**.
- inflorescence** the flower cluster; disposition of the flowers on the floral axis.
- infraspecific** any category of classification below the specific level.
- infructescence** the inflorescence in a fruiting stage.
- infundibuliform** funnel-shaped.
- insectivorous** used of those plants which capture insects and absorb nutriment from them.
- insertion** node or place where one body is attached to its support.
- integument** covering of a body or organ; envelope of an ovule.
- internode** the space or portion of stem between two nodes.
- introduced** used of plants which have been brought from another country; exotic.
- involucre** a whorl or set of bracts around a flower, umbel or head, etc., as in the heads of composites and the flowering dogwood.
- involute** having the edges of the leaves rolled inwards.
- irregular flower** some parts different from other parts of the same whorl; usually applied to zygomorphous flowers.

K

- karyotype** the chromosomal complex characteristic of a group of allied plants; associated with both morphology and number of chromosomes.
- keel** a projecting ridge on a surface, like the keel of a boat; the two front petals of a papilionaceous corolla.
- key or key fruit** a winged-fruit, like in the maples; samara.
- knee** an abrupt bend in a stem or tree trunk; an outgrowth of some tree roots.

L

- labellum** lip, particularly the odd petal in orchids.
- lacerate** with margins appearing as if torn.
- lacinate** cut into deep narrow lobes.
- lactescent** producing milky juice; as in the milkweeds.
- laevigate** smooth, as if polished.
- lamina** the blade or expanded portion of an organ, such as the leaf.
- lanate, lanose** woolly, clothed with soft entangled hairs.
- lanceolate** lance-shaped, about four times long as broad and broadest below or about the middle.
- lanuginose, lanuginous** woolly or cottony; with long and interwoven hairs.
- latex** the milky juice of such plants as the milkweed.
- latifoliate, latifolious** broad-leaved.

- leaching** losing material by percolation, as rain washing away nutriment through the soil.
- leader** the primary or terminal shoot of a tree.
- leaf** the principal appendage or lateral organ borne by the stem or axis. **Simple leaf**: when undivided; **compound leaf**: when divided into distinct parts.
- leaf-scar** the mark or cicatrix left by the fall of a leaf.
- leaf-stalk** the stem of a leaf, petiole.
- leaflet** the separate division of a compound-leaf.
- legume** seed vessel or pod of the pea or bean family; usually dehiscing by both sutures.
- lemma** the lower of the two bracts enclosing the flower in the grasses.
- lenticel** lens-shaped spots on young bark equivalent in function to the stomata on the leaf.
- lepidote** with small scurfy scales.
- liana, liane** a woody climbing or twining plant.
- ligneous** woody.
- ligulate** furnished with a ligule.
- ligule** the strap-shaped corolla in the ray florets of composites; the membranous appendage at the summit of the leaf-sheaths of most grasses.
- linear** long and narrow with nearly parallel margins.
- lip** the principal lobes of a bilabiate corolla or calyx.
- loam** combination of clay with enough sand to counteract the cohering property of the clay; usually implies the presence of considerable decomposed organic matter with accompanying fertility.
- lobed** divided into or bearing lobes.
- locule** compartment of cell; usually referred to the ovary, fruit or anther.
- loculicidal** dehiscient on the back of the cells of a capsule. See also **septicidal**.
- lyrate** pinnatifid with a large terminal lobe and small basal lobes.

M

- macro** in Greek compounds meaning long, large or great.
- maculate** blotched or spotted.
- male** (flowers or plants) having stamens but no pistils.
- marcescent** withering but not falling off.
- midrib** the central vein or rib of a leaf; costa.
- meiosis** reduction division: the process (in cell division) wherein the chromosomes are reduced (by one-half) in number.
- membranaceous** thin and soft in texture.
- mitosis** the process of nuclear duplication involved in cell division.
- monadelphous** stamens united in one group by their filaments.
- moniliform** resembling a string of beads like the legume in *Sophora*.
- mono** in Greek compounds meaning one.
- monocotyledons (monocots)** plants having one cotyledon or seed-lobe, as lilies and grasses. See also **dicotyledons**.

monoecious with unisexual flowers of both sexes on the same plant. See **dioecious**.

muck any kind of impure or decayed peat or black swamp earth, especially when used as manure.

mucronate tipped with a short abrupt point or mucro.

mulch strawy dung or any other material, as leaves, etc., spread on the surface of ground to protect the roots of newly planted shrub or tree.

mule an old word for a cross, particularly between different species; hybrid; cross-breed; usually an infertile hybrid.

multiple fruit the united product (in one body) of several or many flowers; as the pineapple or mulberry. See also **syncarp**.

muricate roughened with short hard points.

mutation deviation occurring by a sudden change in the genetic makeup of a plant or an animal. See also **bud-mutation**.

N

naked flower a flower without perianth.

nectary a place or organ where sugar or nectar is secreted.

nerve a slender rib or vein, particularly if unbranched.

node the place upon the stem which normally bears a leaf or leaves.

nut an indehiscent one-seeded hard and bony fruit.

O

ob Latin prefix usually signifying inversion.

oblanceolate inversely lanceolate; with the broadest part of a lanceolate body away from the point of attachment.

oblique slanting; unequal sided.

oblong at least twice as broad as long.

obovate inverted ovate.

obtuse blunt, rounded.

odd-pinnate see **impari-pinnate**.

offset a plant arising on a stolon or underground branch close to the base of the mother plant.

oleaginous oily and fleshy.

oligo in Greek compounds meaning few.

opaque applied to a surface means dull, not shiny.

orbicular circular; rounded in outline.

ortet the original plant from which a clone is derived.

ovary that part of the pistil containing the ovules or future seeds.

ovate having an outline like that of a hen's egg.

ovule the body which becomes a seed after fertilization.

P

palea the upper bract which with the lemma encloses the flower in grasses.

paleaceous chaffy.

- palmate** (leaf) radiately lobed or divided with three or more veins arising from one point.
- panicle** a compound, usually loose flower-cluster, longer than broad as a branched raceme or corymb.
- pannose** covered with a felt of woolly hair.
- papilionaceous** butterfly-shaped; applied to such a corolla as that of the pea.
- papillose** bearing minute nipple-shaped protuberances.
- pappus** peculiar calyx-limb of composites, being plumose, bristle-like scales or otherwise.
- parasite** an organism which grows on and derives nourishment from another plant, the host.
- parietal** borne on or pertaining to the wall of the fruit.
- pari-pinnate** pinnate with an even number of leaflets. See also **impari-pinnate**.
- parted, partite** cleft nearly but not quite to the base.
- parthenogenesis** producing seed without fertilization.
- pathology** the study of the diseases of plants or animals.
- peat** carbonaceous substance formed by partial decomposition in water of various plants especially sphagnum; used as fertilizer or mulch.
- pedicel** the stalk of a flower.
- pedicellate** borne on a pedicel.
- peduncle** the stalk of a flower-cluster; also used for the stalk of a solitary flower.
- pedunculate** borne on a peduncle.
- peltate** shield-shaped; attached to its stalk inside the margin, like the leaf of nasturtium (*Tropaeolum*) and *Nelumbium*.
- penninerved** nerves arising along a central midrib.
- pentamerous** in fives.
- pepo** a hard-rinded berry of the gourd family such as pumpkin, squash, etc.
- perennial** of three or more seasons duration.
- perfect flower** having both stamens and pistils: bi-sexual. See also **imperfect flower**.
- perfoliate** (leaf) having the stem apparently passing through the leaf.
- peri** Greek prefix meaning around.
- perianth** the floral envelope; commonly used when there is no clear distinction between calyx and corolla; as in the lilies.
- pericarp** the wall of the ripened ovary.
- perigynous** borne around the ovary and not at its base, as in flowers of cherry, where the perianth and stamens are borne on a cup-shaped hypanthium. See also **epigynous** and **hypogynous**.
- persistent** remaining attached, not falling off; opposite of deciduous.
- petal** one of the separate members of the corolla.
- petiole** leaf-stalk.
- petiolule** stalk of a leaflet.
- phenotype** the external appearance resulting from the expression of the genotype: often used to denote a specific appearance pattern shared by several to many individuals.

- photosynthesis** the manufacture of carbohydrates within green leaves by energy derived from light, from simple inorganic materials such as carbon dioxide and water.
- phyllotaxy** the arrangement of leaves on the stem.
- pilose** with long straight hairs.
- pinnate** (leaf) compound with the leaflets placed on each side of a rachis. See also **impari-pinnate** and **pari-pinnate**.
- pinnatifid** cleft or divided in a pinnate way.
- pistil** the seed-bearing organ of a flower consisting of ovary, style and stigma.
- pistillate** having a pistil and no stamens; female.
- placenta** part of the ovary which bears the ovules.
- placentation** the arrangement of placentae within an ovary.
- platy** Greek prefix meaning broad.
- pleio** Greek prefix for full or abounding, or many.
- plicate** folded into plaits.
- plumose** feathery.
- pluri** Latin prefix meaning many.
- pod** a dry dehiscent fruit.
- pollen** spores or grains borne in the anther which later produce sperm cells.
- pollination** the transfer of pollen from the stamen to the stigma.
- poly** Greek prefix meaning many.
- polycotyledonous** having several cotyledons.
- polygamous** bearing unisexual and bisexual flowers on the same plant.
- polypetalous** having separate petals; choripetalous. See also **gamopetalous**.
- polyploid** plant with a chromosome complement of more than two sets of the haploid number.
- pome** a fleshy fruit like the apple and pear.
- procumbent** trailing on the ground.
- prickle** spine-like outgrowth from bark or epidermis.
- primocane** the first year's cane (seldom producing flowers) of *Rubus* and similar genera.
- prostrate** lying flat on the ground.
- pruinose** covered with a waxy, powdery secretion on the surface; a bloom.
- pruning** artificial removal of twigs or branches from trees, shrubs, etc.
- pruning shears** strong-bladed shears used in light pruning of woody ornamentals.
- pseudo** Greek prefix for false, as **pseudo-bulb**.
- puberulent, puberulous** minutely pubescent.
- pubescent** covered with hairs, particularly if short and soft.
- pulvinate** cushioned.
- punctate** with translucent or colored dots or depressions.
- pungent** prickly-tipped as in the holly; acrid.

pyrene a seed-like nutlet or stone of a small drupe.
pyriform pear-shaped.

Q

quadri Latin prefix meaning four; as **quadrangular** (four-angled); **quadrifoliate** (four-leaved); **quadrifid** (four-cleft).
quaternate in fours.
quinate in fives.
quinque Latin prefix meaning five; as **quinquelocular** (five-celled).

R

race a permanent variety or group of individuals whose distinguishing characters are constant and are reproduced true to type from seed.
raceme a simple inflorescence of stalked flowers on a more or less elongated axis.
racemose in racemes or resembling a raceme.
rachis an axis bearing flowers or leaflets.
radiate spreading from a common center; with ray-flowers.
ramet any individual of a clone.
ray the margin portion of a composite flower head when distinct from the disk.
receptacle the more or less expanded portion of an axis which bears the organs of a flower or the collected flowers of a head.
recurved curved downward or backward.
reflexed abruptly turned downward.
reniform kidney-shaped.
repand with a slightly sinuate margin.
reticulate in the form of a network; net-veined.
retuse slightly notched at the rounded apex.
revolute rolled backward.
rhachis see **rachis**.
rhizome an underground stem, often enlarged by food storage.
rib a primary or prominent vein in leaf.
root prune pruning of roots, especially in preparation or in the process of transplanting trees or shrubs; a technique used to force flowering (e.g. *Wisteria*).
rosette a cluster of leaves or other organs in a compact circular arrangement.
rostrate beaked.
rotate (corolla) wheel-shaped; a flat circular limb with a short tube.
rufous reddish brown.
rugose wrinkled.
runcinate coarsely saw-toothed or cut, the pointed teeth turned toward the base of the leaf; as in the dandelion.
runner a slender and prostrate branch, rooting at the end or at the joint.

S

saccate sac-shaped.
sagittate shaped like an arrow-head, the basal lobes directed downward.

- salver-shaped** (flower) with a slender tube abruptly expanded into a flat limb.
- samara** an indehiscent winged fruit. See **key**.
- scabrous** rough to the touch.
- scale** a minute leaf or bract, usually appressed or dry.
- scandent** climbing.
- scape** a peduncle rising from the ground, naked or without proper foliage.
- scarious** thin and dry, not green.
- scion** a slip or shoot used for grafting. See **graft**.
- scorpioid** coiled (ring-like) while in bud.
- scrobiculate** pitted.
- seed** the ripened ovule consisting of the embryo and its integuments.
- semi-double** partly changed into a double flower with the inner stamens perfect and the outer stamens petaloid.
- sepal** a division of the calyx.
- separation** multiplication of plants by means of naturally detachable asexual bodies or organs, as offsets, stolon.
- septicidal** dehiscing along or in the partitions. See also **loculicidal**.
- septifragal** where the valves in dehiscence break away from the partitions.
- septum** a partition.
- serrate** having teeth pointing forward.
- serrulate** serrate with fine teeth.
- sessile** without any stalk.
- setaceous** bristle-like.
- setose** beset with bristles.
- sheath** a tubular envelope, as the lower part of the leaf in grasses.
- shrub** a woody plant branched from the base.
- sinuate** with the outlines of the margin strongly wavy.
- sinus** the recess between lobes, as in the leaves of some oaks.
- slip** a softwood cutting "slipped" off or pulled off; applied also to similar parts cut off.
- spadix** a spike with a fleshy axis.
- spathe** a large bract or pair of bracts inclosing the inflorescence; like Jack-in-the pulpit.
- spathulate** gradually narrowed from a rounded summit.
- species** a natural botanical unit; composed of individuals which exhibit characters distinguishing them from all other units within a genus, still not differing from one another beyond the limits of a recognizable and integrated pattern of variation.
- spicate** arranged in or resembling a spike.
- spike** a simple inflorescence with the flowers sessile or nearly so on a common axis.
- spine** a sharp-pointed woody outgrowth from the stem.
- sport** a sudden deviation starting from a bud or seed.

- spur** any projecting appendage of a flower, looking like a spur but hollow; as in larkspur.
- stamen** the pollen-bearing male organ of a flower.
- staminate** having stamens and no pistil; male.
- staminode, staminodium** a sterile stamen or similar structure inserted between the corolla and the pistil.
- standard** the upper broad petal of a papilionaceous flower.
- stellate** star-shaped; where several similar parts spread out from a common center, like a star.
- stem** the axis or axes of a plant arising from its root.
- sterile** barren; not fertile; the petiole of a fern frond.
- stigma** the part of the pistil that receives the pollen.
- stipe** the stalk of a pistil.
- stipitate** having a stipe.
- stipule** the appendage at the base of the petiole, usually one on each side.
- stock** the part on which the scion is grafted; the strain or parentage.
- stolon** a slender stem above or below ground which produces a new plant at its tip.
- stoloniferous** bearing stolons.
- stoma** (pl. **stomata**) or **stomate** a "breathing" pore in the epidermis of the leaf leading into an intercellular space communicating with the internal tissue.
- stool** a clump of roots or rootstalk that may be used in propagation; also an established low plant from which layers are taken.
- strain** a group of plants differing from the race to which it belongs by no apparent morphological characters, but by some enhanced or improved growth characteristics; as heavier yield in fruit; resistance to disease, etc.
- stratification** the operation or method of burying seeds to keep them fresh and to soften their integuments, or to expose them without injury to cold temperatures, that they may be more readily and successfully germinated.
- striate** marked with fine longitudinal lines.
- strict** very straight and upright.
- strigose** beset with appressed straight and stiff hairs.
- strike** to emit roots as from a cutting.
- strobile** an inflorescence marked by imbricated bracts or scales; as in the pine-cone.
- style** a stalk between the ovary and stigma.
- subshrub** an under-shrub or small shrub which may have partially herbaceous stems.
- subulate** awl-shaped.
- succulent** fleshy; juicy.
- sucker** a shoot arising from the roots or beneath the surface of the ground.
- suffrutescent** slightly woody; woody at the base.

suffruticose perennial plant with only the lower part of the stem and of the branches woody and persistent.

sulcate grooved or furrowed.

superior ovary borne above the insertion of the perianth and free from it. See also **inferior ovary**.

suture a line of splitting.

syncarp a fleshy aggregate fruit.

T

taxon (pl. **taxa**) a general term applied to any taxonomic element, population, or group regardless of its level of classification.

taxonomy the science of classification and arrangement of living organisms according to relationships.

tendrill a coiling thread-like organ by which a plant grasps an object for support.

tepal used for sepals and petals of similar form and not readily distinguishable; as in the lily or tulip.

teratology the subject of monstrosities, or of abnormal and aberrant forms and malformations.

terete circular in cross section.

ternate in threes.

testa the outer seed-coat.

tetra Greek prefix meaning four; **tetragonal** (four-angled); **tetragonous** (with four pistils or styles); **tetramerous** (with its parts or sets in fours); **tetrandous** (with four stamens).

tetradynamous six stamens, four long and two short.

throat the place where the limb of the corolla joins the corolla-tube.

thyrs a compact narrow panicle.

tomentose dense woolly pubescence.

tomentum dense covering of matted hairs.

topiary ornamental gardening in which trees and shrubs are clipped into formal shapes.

tortuous twisted or bent.

tree a woody plant with one main stem, and at least four to five meters tall.

tri Latin prefix signifying three or thrice, as **trifoliolate** (with three leaflets).

trichome any hair-like outgrowth of the epidermis.

triploid having three sets of chromosomes (i.e., three times the haploid number).

truncate the end nearly straight across; as the apex of the leaf in the tulip-tree.

tuber a thickened portion of a subterranean stem or branch, provided with eyes (buds) on the sides.

tuberous bearing or producing tubers.

tumid swollen.

turbinate top-shaped; inversely conical.

turgid swollen as a result of internal water pressure.

type the specimen with which the scientific name of a taxon is always associated; the type along with other related specimens is used in describing the taxon.

U

umbel an inflorescence with pedicels or branches arising at the same point and of nearly equal length.

undulate wavy surface or margin.

uni in compound words meaning one.

unisexual of one sex, either staminate or pistillate.

urceolate urn-shaped.

utricle a small bladder; a bladdery one-seeded fruit.

V

vaginate sheathed or surrounded by a sheath.

valvate opening by valves; meeting by the edges without overlapping as leaves or petals in the bud.

variety (as a botanical unit) a sub-division of the species composed of individuals differing from other members of the species in certain minor characters which are usually perpetuated through generations by seed.

vascular with vessels or ducts.

veins the small ribs or branches of the framework of leaves.

velutinous velvety.

venation arrangement of veins.

ventral relating to the inner surface or part of an organ; the part nearer the axis.

ventricose swelling unequally, or inflated on one side.

vernation the arrangement of leaves in the bud.

verrucose covered with wart-like elevations.

versatile relating to an anther attached near the middle and moving freely on its support.

verticillate disposed in a whorl.

villous bearing long and soft, usually curved or curly, hairs.

viscid glutinous; sticky.

W

whorl the arrangement of three or more like organs in a circle around the axis.

wing any membranous expansion.

woolly clothed with long and entangled soft hairs.

Z

zygomorphic said of a flower which can be bisected only in one plane in similar halves.

CLARENCE E. KOBUSKI

ARNOLDIA



A continuation of the BULLETIN OF POPULAR INFORMATION of the Arnold Arboretum, Harvard University

VOLUME 15

SEPTEMBER 23, 1955

NUMBER 8

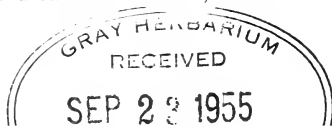
POTENTILLA FRUTICOSA, A COMMON BUT LITTLE KNOWN PLANT

THE bush cinquefoil (*Potentilla fruticosa*) is one of the few woody plants native over both northern hemispheres. It can be found as a low mat of dense woody growth on top of the Olympic Mountains in Washington or high up in the Himalayas, and as three-foot shrubs in Michigan, as well as in Great Britain, Europe and China. Because of its wide habitat, there are many varieties being grown in various parts of the world, but all are considered as low shrubs under four feet in height. Today, with our interest centered on planting small properties, such small shrubs should be of considerable value.

Not only are these plants valued from the standpoint of their height, but they also are in that admirable class which do not have any serious insect or disease troubles. Then, too, the entire group is of interest for several months in the summer time when few woody shrubs produce blooms, for their small bright yellow or white flowers begin to appear in July and are in evidence throughout the summer and well into the fall. Several varieties have originated in English gardens, some have been introduced from far off China and the Himalayan region, and some we have growing right here in America. Unfortunately many varieties have been named, new ones appearing periodically and unquestionably many have become mixed in the trade and in botanical gardens.

It is incorrect to claim that these are outstanding ornamental plants. They are not in the same ornamental class with the rose, or the azaleas, but they are of value because of their interest in the summer, their low dense habit of growth, and their lack of persistent insect and disease pests. Plantsmen are usually anxious to grow those shrubs and trees which require no care, and the varieties of this species are certainly in this category. One plant has been growing in the Arnold Arboretum for 65 years, and never has required any spraying.

Some of these varieties have been described in horticultural literature, but usu-



ally only one or two varieties are mentioned at one time. At least twenty five varieties have been named, fourteen of them are being grown in the collections of the Arnold Arboretum.

All are not sufficiently different to warrant growing them in landscape plantings, for some are so similar that it is impossible for the gardener to tell them apart unless they are observed growing side by side.

First and foremost these are sun demanding plants which will not grow well in shaded situations. In order to flower profusely they must have a situation in the full sun. They seem to grow in any normal soil. Poor dry soil situations will result in slower less vigorous growth, for they do not require large amounts of moisture. The leaves are small and compound, usually with 3-7 leaflets, the single flowers having five petals are about $\frac{3}{4}$ of an inch in diameter, some varieties having white flowers but most being a creamy white to deep yellow. The fruits are dried capsules which unfortunately can remain on the plant several years and so give it a rather untidy appearance. This can be alleviated by light pruning in the fall after the flowering period is over.

The *Potentillas* are not susceptible to severe insect or disease pests. The species is easily propagated by seeds, and the varieties are easily propagated by softwood cuttings. As noted previously, these are not conspicuous landscape plants, but their small size, dense habit, length of bloom, hardiness and ease of cultivation make them of increasing interest in small gardens where summer interest is desired.

The following notes were made from the plants as they grow in the Arnold Arboretum, with additional notes from the herbarium specimens and standard references. Additional varieties recently appearing in nursery catalogues but for which detailed information is unavailable at this time include: "Farrer's White," "Jackman's Variety," "farreri prostrata," "waltoniensis," "hersii."

Varieties

albicans: flowers bright yellow; leaves white tomentose beneath; said to be a handsome form but not growing in the collections at the Arnold Arboretum. Somewhat similar to *beesi* (see below).

beani: flowers white, originating before 1910 and formerly termed var. *leucantha*. It is reportedly a hybrid between *P. fruticosa friedrichseni* and *dahurica*.

beesi: flowers yellow; leaves white, hairy above and below giving them a strictly silvery hue. Our plant was received from the nursery of H. G. Hillier, Winchester, England, a few years ago (who had it in 1952), and is found in some European catalogues listed as the variety *nana argentea*. Similar to *albicans* but differs in that the upper surfaces of the leaves are more hairy than the the under leaf surfaces.

dahurica: flowers white; native of northern China and Siberia; differing from



PLATE VII

This plant of *Potentilla fruticosa* growing in the Arnold Arboretum is 65 years old, about 4' high and 6' in diameter—a living example of a small shrub that stays a small shrub without much attention.

some of the other varieties by being less than $1\frac{1}{2}'$ tall. Although it was introduced into cultivation over a century ago (1822) it is still very rare.

farreri: flowers deep yellow; leaves very small, the individual leaflets being less than 8 mm. in length, making them the smallest of any of the varieties here mentioned. This was first collected by Reginald Farrer in Tibet in 1920 at an altitude of 8,000 feet. The variety *purdomi*, also coming from Tibet, has flowers that are a lighter yellow. Our plant in the Arnold Arboretum, although about twenty years old is only two feet high and three feet across, making it one of the truly dwarf forms. It is similar to *parvifolia*, except it is slightly lower in height.

friedrichseni: flowers creamy white to pale yellow, one of the more vigorous growing forms, originating in the famous Spaeth Nurseries in Germany about 1895. Our plant, about 53 years old, is four and a half feet high and six feet across.

grandiflora: flowers bright yellow and up to $1\frac{3}{8}''$ in diameter, with leaves about the largest of any of the varieties here listed. In England this is supposed to be the most vigorous and tallest of all, sometimes reaching a height of 6', but our plant is not so vigorous at present.

mandshurica: flowers white; leaves with densely whitish pubescence on upper and lower surfaces and slightly smaller than the leaves of either *veitchi* or *dahurica*. The habit is lower than that of *friedrichseni*.

micrandra: flowers bright yellow, shrub of a lower spreading habit than the species
ochroleuca: flowers creamy white; foliage light green; plant originated in the Spaeth Nurseries in Germany prior to 1902.

parvifolia: flowers deep yellow; leaves small and less than 8 mm. long although not so small as those of *farreri*. The leaflets are either 5 or 7 in number, and the plant habit, the flowers and flower color are similar to *farreri*, although it is slightly taller. The plant in the Arboretum has been growing in the same spot in the shrub collection since 1924, and is 4' high and 4' across, being very dense, one of best of the deep yellow flowered varieties.

pumila: listed as being a dwarf variety with silky pubescent leaves, this variety is not now in the living collections of the Arboretum.

purdomi: flowers pale yellow; leaflets usually less than 8 mm. long but slightly larger than those of *farreri*. Our plant was grown from seed collected by Purdom in southern China in 1911, and was "reluctantly" named by Rehder in 1922, for at the time he admitted that it differed only slightly from some of the other forms. A batch of seed from our plant sown a few years ago, resulted in seedlings of a surprisingly uniform habit and flower color. This plant today is one of the densest and best rounded of all the varieties.

pyrenaica: flowers bright yellow; habit dwarf, being only 6''-18'' high, coming from the Pyrenees Mountains, differing only from the species in its more dwarf habit.

- rigida:** flowers bright yellow; usually the leaves have only three leaflets; introduced from the Himalayas about 1906.
- tenuiloba:** flowers bright yellow; leaflets very small and practically linear, often produced in clusters. Our 34 year old plant is only 18" tall and 3' across. This variety is a native of western North America and is at present the most dwarf of all the varieties growing in the Arboretum.
- veitchi:** flowers white; being the best of all the varieties for white flowers. This was introduced by E. H. Wilson from Hupeh Province in China during 1900 from an elevation of approximately 6,000'.
- vilmoriniana:** flowers pale yellow to creamy white and a native of the northern British Isles. The foliage is silvery tomentose, somewhat similar to that of "Katherine Dykes" although the leaves of the latter are smaller.
- "Gold Drop": a seedling, similar to the variety *purdomi* but with smaller leaves, first offered in this country by Wayside Gardens of Mentor, Ohio, about 1953. It is practically identical in flower with both *farreri* and *parvifolia*.
- "Katherine Dykes": flowers pale yellow; foliage silvery green in color. This plant originated as a chance seedling in an English garden prior to 1946. It is of value for its silvery foliage although the variety *beesi* is better.
- "Moonlight": flowers pale yellow, slightly darker than those of "Katherine Dykes" and the leaves are larger and a darker green. It originated about 1950. The leaves are similar to those of *vilmoriniana* except they are slightly smaller.

The differences noted above among the varieties can be considered minute. After all, with the exception of three or four dwarf varieties, the remainder have approximately the same habit. For those who are not particular whether the flowers are white, creamy white, or yellow, they need not be particular concerning the variety of *Potentilla fruticosa* they obtain — any available variety would probably be satisfactory. For those plantsmen who are more particular, the following suggestions might prove helpful:

**The best of the *Potentilla fruticosa* varieties
for Landscape planting**

For dwarf habit	dahurica or tenuiloba
Most vigorous	grandiflora or friedrichseni
For silvery foliage	beesi, "Katherine Dykes" or vilmoriniana
For smallest leaves	farreri
For pale yellow flowers	ochroleuca or purdomi
For bright yellow flowers	"Gold Drop," farreri, grandiflora or parvifolia
For white flowers	veitchi

Two New Plants

***Lonicera tatarica* "ARNOLD RED"**

The "Arnold Red" clone of the Tatarian honeysuckle originated from seed at the Arnold Arboretum in 1945 and first bloomed in 1947. It has all the excellent qualities of *Lonicera tatarica*, being of vigorous growth, hardy throughout most of the northern United States. The flowers are the darkest red of any of the *Lonicera tatarica* varieties, even darker than those of *L. tatarica sibirica*, being Rose Bengal 25/1 of the Royal Horticultural Society's Colour Chart when they first open. They are about 1" in diameter and the dark red fruits are approximately $\frac{3}{8}$ " in diameter, being larger than those of any *L. tatarica* varieties. It was first distributed by the Arnold Arboretum to commercial nurserymen in October 1954, and soon should be available commercially, for like other honeysuckles, hard and soft wood cuttings root easily. However, unless a darker flowered variety is wanted (or one with larger fruits) the easily available species and a few other varieties are still excellent general service plants to use in any garden.

***Tsuga caroliniana* "ARNOLD PYRAMID"**

This plant appeared in a batch of 175 seedlings acquired by the Arnold Arboretum in 1926 from the H. P. Kelsey Nursery Company of East Boxford, Mass. All others in this lot were normal Carolina Hemlocks except this one. It has been allowed to grow this long unheralded, merely to make certain that the densely pyramidal growth will remain constant, which it has. From the accompanying picture (Plate VIII), taken in 1949, of the then 24 year old tree, it is evident that the dense pyramidal growth is being maintained, and the tree appears this way today, although the plant is somewhat taller. Actually it is now about 25' tall and about 15' in the spread of its branches. This clone does have possibilities as a landscape tree.

The "Arnold Pyramid" hemlock is a bushy, dense growing form of *Tsuga caroliniana*, with many trunks coming from the base of the plant. The variety *compacta* listed years ago by Hornibrook in his "Dwarf and Slow Growing Conifers" (1939) was described from a tree started in the Arnold Arboretum about 1881. Even Professor Sargent noted much later, that this form was becoming more and more vigorous and finally, about 1940, it could not be distinguished from the species. A picture of it taken by Alfred Rehder in 1921 showed a round headed tree with very wide spreading branches, with no similarity in form to this newer "Arnold Pyramid."

Another tree growing in the Arboretum under the name of *Tsuga caroliniana compacta* is in a rather poor location, showing dense foliage but not this closely pyramidal form.

The Carolina Hemlock has produced few if any clones that have been described to date, while there are nearly a hundred of the Canada Hemlock. As far as we can tell, this dense growing "Arnold Pyramid" has no additional ornamental



PLATE VIII

Tsuga caroliniana "Arnold Pyramid." At the time this picture was taken, this plant was 18' tall. It is now 25' tall and 15' in branch spread, being approximately 32 years old and has never been sheared.

value over and above some of the Canada Hemlock forms, but it is of interest to know that this clone does exist and it is of sufficient value to be named and distributed. The Arboretum has scheduled this for distribution in 1956, but because of its slow growth it will probably be many years before nurserymen have the opportunity to work up a large stock. It is more difficult to propagate than the Canada Hemlock, and Mr. Roger Coggeshall, Propagator of the Arnold Arboretum, has found it very difficult to graft, although about 25% of the cuttings taken in October to November will root.

DONALD WYMAN

FALL CLASSES
at the
ARNOLD ARBORETUM

LAST REMINDER: Once again classes will be offered this fall as part of the Arboretum's Educational Program. Registration is in advance by mail. Priority will be established on post office date of application. For further information and application, write Dr. Carrol E. Wood, Jr., Arnold Arboretum, Jamaica Plain 30, Massachusetts.

Basic Botany for the Home Gardener Instructor: Dr. Carroll E. Wood, Jr.
8 sessions. Thursday evenings, 7-9, September 29-November 17. Fee \$10.00

Fall Field Class in Ornamental Plants Instructor: Dr. Donald Wyman
6 sessions. Friday mornings, 10-12, September 30-November 4. Fee \$2.00

Plant Propagation I Instructor: Mr. Roger Coggeshall
6 sessions. Wednesdays, October 19-November 28 (three sections). Fee \$10.00

Principles and Practice in Plant Identification
Instructor: Dr. Richard A. Howard
8 sessions. Tuesday evenings, 7-9, October 4-November 22. Fee \$10.00

ARNOLDIA



A continuation of the BULLETIN OF POPULAR INFORMATION of the Arnold Arboretum, Harvard University

VOLUME 15

OCTOBER 28, 1955

NUMBER 9

COTONEASTERS

THE cotoneasters fruited very well in the Arboretum this fall, making about as fine a display as we have had from this group in many years. The large plant of *Cotoneaster racemiflora soongorica*, which E. H. Wilson liked so well, fruited profusely. Viewing it this fall, one can well understand why Wilson frequently put this plant at the top of his cotoneaster selections. There are about 75 different species and varieties of cotoneasters growing in the collections of the Arnold Arboretum. For those who are interested in plants it is always difficult to make a selection of "the best" but, because there are so many here and actually available in the nurseries of the country, an attempt will be made to suggest those that seem to have merit as landscape plants and those that do not.

The cotoneasters are all shrubs, some prostrate and but a few inches high (*C. adpressa* which in fifty years growth in the Arnold Arboretum is a plant only 12 inches high by 48 inches across), others tall, vigorous shrubs that may grow to eighteen feet or more in height. Recent work in the Arboretum by Mrs. Karl Sax has shown that most species will come true from seed even though collected from many species growing together in a crowded collection.

They are as a group, natives of northern Asia, the Himalayan area and a few of Europe. Flowers in general are small and white, in some species borne singly or in twos and threes, and in others in flat clusters one or two inches in diameter. There are a few species like *Cotoneaster multiflora* that make a show when they are in bloom, but mostly these plants are valued for their red or black fruits. These vary in size, most are about a quarter of an inch in diameter and are borne like the flowers, singly or in twos or threes in some species, and in bunches of 8-10 or more in others. In England many cotoneasters are highly esteemed and there are several which thrive in plantings along the highways, but unfortunately in America they can have several troublesome pests which may prove difficult to combat. Being closely related to apples, pears, and hawthorns, they too are sus-



ceptible to fire blight, borers, lace bug and frequently red spiders. In some areas, none of these pests may be prominent, but in others, one or more of them may be so bad as to limit the number of cotoneasters planted. The plants in the Arboretum are frequently troubled with lace bug and red spider, and occasionally are infested with fire blight.

Sometimes the fire blight can be controlled. The old-fashioned method used to be to spray with lime sulfur, but now there are some of the anti-biotics available which show promise of control on apple trees and so may work on cotoneasters as well. In any event, the cotoneasters as a group are used for their ornamental fruits, for their interesting forms or habits of growth and some for their evergreen foliage.

There are many of the cotoneasters with black fruits. These, with one or two exceptions are not easily seen in the fall when the foliage is still present. Hence, most black-fruited cotoneasters have little ornamental merit. They may be vigorous growers and some may make fine shrubs, but, since all cotoneasters are subject to possible infestations of the disease or insect pests mentioned, it does not seem wise to grow some of the deciduous (and black-fruited) forms, when other kinds of shrubs not susceptible to disease and insect attack will do just as well, i.e., viburnums, forsythias and honeysuckles. Consequently, in the list suggested for discard because of the lack of ornamental value a majority of the black-fruited forms appear.

The recommended cotoneasters can be divided into the following four general size groups:

Prostrate Cotoneasters

There are five of these in the recommended list, *C. adpressa* being the hardiest but probably the slowest in growth. Our plant, acquired in 1903, is only one foot high and four feet across, but has probably been overly impeded in its growth by poor soil. Of the others, *C. dammeri* makes rapid growth and because it grows flat on the ground, it roots readily along its stems making an excellent ground cover, but it is not thoroughly hardy in Boston. The *C. microphylla* forms make excellent rock garden plants especially the variety *thymifolia*, which has the smallest leaves of any of the hardy cotoneasters. Where it is hardy, *C. conspicua decora* is one of the most beautiful in this group, but I doubt that our plants will prove hardy every winter even though they have lived through the last two with little injury.

Cotoneasters about 3 feet high

Perhaps *C. horizontalis* is the most popular of this group, being widely grown because of its low, horizontal habit and bank-covering qualities. For some reason or other *C. apiculata* has been generally overlooked in landscape planting. It has larger fruits and slightly larger leaves than does *C. horizontalis*, and so might have added merit in certain places. *Cotoneaster adpressa praecox* is a mound-like plant, very dense and lacking the long horizontal branches of *C. horizontalis*, while *C.*



PLATE IX

Cotoneaster salicifolia floccosa as it grows in Williamsburg, Virginia.

microphylla is an evergreen and so has merit in any rockery planting. Although we have plants of both *C. congesta* and *C. conspicua* growing here at present, they are small and have been exposed only to mild winters the last two years, but they very likely may not survive a truly cold winter. Farther south, however, they make excellent plants.

Cotoneasters 4-6 feet high

There are ten of these listed, all with red fruits and none of them fully evergreen. For good foliage qualities and a large mass of flowers (which none too many cotoneasters have) there are *C. bullata* and its variety *floribunda*, *C. multiflora calocarpa* and *C. hupehensis*. At least two have a yellow autumn color in the fall—*C. hupehensis* and *C. zabeli miniata*, while the leaves of *C. dielsiana elegans* and *C. francheti* remain on the plants very late in the fall.

There are three species rather similar in landscape effect, namely *C. divaricata*, *C. dielsiana* and *C. zabeli*. The latter has slightly larger fruits in larger clusters. Both *C. dielsiana* and *C. zabeli* are gracefully arching shrubs and one can easily be substituted for the other in any landscape planting, while *C. divaricata* is more dense and upright in habit without the arching outside branches.

Cotoneasters 8-18 feet high

It is these taller-growing cotoneasters which should be used with discretion. They are tall and vigorous, taking up much space, a well-grown plant of *C. racemiflora soongorica* that may be 8 feet tall will be at least 15 feet in branch spread. Hence, to do well, and one should keep in mind that they are used primarily for their fruits, they should have plenty of space. The only black-fruited forms recommended in this group are *C. lucida*, with lustrous foliage and a dense habit of growth, and *C. foveolata*, with striking leaves and upright habit. The leaves of the latter turn a good red to orange in the fall, while the fruits of *C. lucida* drop rather early, falling by September 20 of this year when the fruits of most of the others were in their prime. Still the lustrous foliage of this species has some merit.

There is a plant of *C. frigida* growing in the Arboretum at present, but here again, the warm winters recently have been responsible for its survival. Actually it is not dependable north of Richmond, Va. Its more heavily-fruited form is the variety *vicari*. The plant which is used a great deal throughout the mid-south is *C. salicifolia floccosa*, the hardiest variety of this species and hardy except for the most severe winters, even in southern New England. Its arching habit, lanceolate leaves and profuse berries, make it most popular in all types of planting.

Cotoneaster racemiflora soongorica is the hardiest variety of a variable species, but unfortunately it does not appear to fruit as profusely every year as some of the others. *Cotoneaster tomentosa* is valued for the foliage, the under surface of the leaves being whitish, and the leaves of *C. simonsi* are lustrous green giving it an interesting quality at other times of the year also. All these but the two mentioned have red fruit.



PLATE X

Above: *Cotoneaster multiflora* growing in the Arnold Arboretum is one of the few cotoneasters ornamentally valued for its flowers. Below: An excellent planting of *Cotoneaster adpressa* in the Royal Botanic Garden, Edinburgh, Scotland.

RECOMMENDED COTONEASTERS

<i>Scientific Name</i>	<i>Evergreen or Deciduous</i>	<i>Height</i>	<i>Hardiness Zone</i>	<i>Size of Fruit</i>	<i>Color of Fruit</i>	<i>Notes</i>
adpressa	D	prostrate	4	1 cm.	red	one of the most dwarf
" praecox	D	3'	4	1.1 cm.	"	excellent mounded form
apiculata	D	3'	4	1 cm.	"	similar to <i>C. horizontalis</i> but larger leaves and fruits
bullata	D	6'+	5	8 mm.	"	excellent bright red fruits
" floribunda	D	6'+	5	8 mm.	"	more flowers in a cyme than in <i>C. bullata</i>
congesta	E	3'	6	6 mm.	"	pretty, dense, creeping
conspicua	E	3'	7?	9 mm.	"	probably none too hardy north
" decora	E	prostrate	7?	9 mm.	"	excellent for covering banks
dammeri	E	"	5	7 mm.	"	excellent for ground cover
dielsiana	D	6'	5	6 mm.	scarlet	fruits lustrous
" elegans	SE	6'	5	6 mm.	"	leaves remaining on plant into winter
divaricata	D	6'	5	8 mm.	red	one of handsomest in fruit
foveolata	D	9'	4	9 mm.	black	leaves turn bright red to orange in fall
francheti	SE	6'	6	7 mm.	orange-red	one of the few with orange-scarlet fruit
frigida	D	18'	7	5 mm.	red	one of best shrubs in English gardens
" vicari	D	18'	7	5 mm.	"	free-fruiting form

horizontalis	SE	3'	4	7 mm.	red	one of the most popular of the cotoneasters
hupehensis	D	6'	4	8 mm.	"	leaves turn yellow in the fall
lucida	D	9'	4	9 mm.	black	leaves lustrous
microphylla	E	3'	5	6 mm.	red	somewhat smaller than <i>C. horizontalis</i>
" cochleata	E	prostrate	5	6 mm.	"	an excellent form
" thymifolia	E	"	5	5 mm.	"	smallest leaves of any cotoneaster
multiflora calocarpa	D	6'	5	1.1 cm.	"	fruit larger than that of species
racemiflora soongorica	D	8'	3	8 mm.	"	hardest variety of this species
salicifolia floccosa	SE	13'	5	6 mm.	"	hardest variety of this species
simonsi	D	12'	5	5 mm.	"	leaves lustrous
tomentosa	D	9'	4	9 mm.	"	leaves whitish on under surface
zabeli	D	6'	4	8 mm.	"	fruits in cluster of 8 or more
" miniata	D	6'	4	7 mm.	orange-scarlet	leaves turn yellow in autumn

SE=semi-evergreen, leaves remain on plant considerably into the winter.

Cotoneasters With Little Ornamental Value

<i>C. acuminata</i>	not superior to <i>C. dielsiana</i> or <i>C. divaricata</i> .
<i>C. acutifolia</i>	black fruit falls in early September.
<i>C. " villosula</i>	not much different from <i>C. acutifolia</i> .
<i>C. affinis bacillaris</i>	unkempt habit, dull red to black fruits, seems to be more susceptible to fire blight than some of the others.
<i>C. ambigua</i>	differs only slightly from <i>C. acutifolia</i> .
<i>C. amoena</i>	closely similar to <i>C. francheti</i> .
<i>C. bullata macrophylla</i>	leaves too large and coarse.
<i>C. dielsiana major</i>	not superior ornamentally to species.
<i>C. disticha</i>	strongly resembles <i>C. horizontalis</i> but not superior to it.
<i>C. frigida aldenhamensis</i>	only minutely different from species.
<i>C. horizontalis perpusilla</i>	smaller fruits than species.
<i>C. integerrima</i>	open habit, fruits merely a dull red.
<i>C. lindleyi</i>	fruit black, foliage coarse.
<i>C. melanocarpa</i>	black fruits.
<i>C. " laxiflora</i>	black fruits.
<i>C. " commixta</i>	black fruits.
<i>C. moupinensis</i>	black fruits. <i>C. foreolata</i> is similar and much more widely used.
<i>C. multiflora</i>	red fruits, but not as large as those of its variety <i>calocarpa</i> . Otherwise an excellent plant.
<i>C. multiflora granatensis</i>	differs only minutely from var. <i>calocarpa</i> .
<i>C. nitens</i>	black fruits, sparse foliage.
<i>C. obscura</i>	fruit dark red and lustrous, but no better than the common <i>C. dielsiana</i> .
<i>C. obscura cornifolia</i>	fruit purple black.
<i>C. racemiflora</i>	not as profuse in fruit and less hardy than the variety <i>soongorica</i> .
<i>C. racemiflora veitchi</i>	same as above.
<i>C. rosea</i>	similar in general to <i>C. racemiflora soongorica</i> , but in our collection one of the most susceptible to fire blight.
<i>C. salicifolia</i>	red fruits are smaller than those of <i>C. salicifolia floccosa</i> .
<i>C. " rugosa</i>	not superior to <i>C. salicifolia floccosa</i> .
<i>C. tenuipes</i>	black fruits.
<i>C. uniflora</i>	closely related to and no better than <i>C. integerrima</i> .

The cotoneasters listed above might well be omitted from most ornamental plantings if one is willing to accept the reasons for discarding them. After all, there are twenty nine of the better species and varieties in the recommended list with varying sizes, habits and suitable for several purposes.

DONALD WYMAN

ARNOLDIA



A continuation of the
BULLETIN OF POPULAR INFORMATION
of the Arnold Arboretum, Harvard University

VOLUME 15

DECEMBER 16, 1955

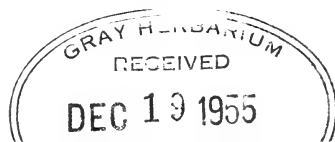
NUMBERS 10-12

CHRISTMAS PLANTS IN THE BOSTON AREA

HOLLY, mistletoe and poinsettia almost automatically bring to the minds of North Americans thoughts of Christmas, so intimately associated with the Christmas season have these plants become. But these are only a few of the ever-increasing numbers of plants which find their way into the markets at this season. These familiar plants, the Christmas trees, the native evergreens, the bayberry, and the much-used cones and fruits are being supplemented by fresh flowers from as far away as South Africa or Hawaii, by foliage plants from Mexico, California, Washington and Florida and by dried plants from almost everywhere. Many of these plants are known by several common names, by names which obscure their identities or by coined trade names. Their sources and true identities are often unknown to the wholesaler, the retailer, the customer and even to professional botanists.

We have followed with considerable interest the Christmas plants mentioned in national horticultural magazines and those appearing in the Boston markets at this season and have attempted to draw together a preliminary list of those available in this area. This is by no means an exhaustive account but an attempt to present at least the principal plants used, together with their proper identifications and notes of general interest. Some of the plants appearing in dried, painted or fragmentary condition have proved to be real botanical puzzlers, but we have finally been able to identify all as far as the genus, at any rate, with the exception of a gaudy silvered and painted example which we have not even been able to place in a family.

Plants are grouped by categories of general usage (for example, Christmas Trees, Wreath Plants, etc.) and are listed alphabetically by common name under each of these groupings. It will be immediately evident that some plants fall in more than one group, but we have not, with some exceptions, attempted to list a plant more than once. Neither have we attempted to include cut flowers or pot



plants, with the exception of those which are especially associated with the Christmas season in this part of the world. Readers in this and other parts of the United States will doubtless find many plants with which they are familiar and will know of others which should have been included. We should be most pleased to have corrections, additional names, and materials which might lead in time to a more comprehensive listing.

Drawings illustrating some of the less familiar plants kindly have been made by Dr. Ding Hou, to whom we are much indebted. Many people in the local area have generously provided us with information of various kinds. We are especially grateful to Mr. Milton Robinson, of Henry M. Robinson and Company, of Boston, for his aid.

The tremendous quantities of plants used at the Christmas season and then promptly discarded raise important questions of the conservation of our native plants. Some, such as the ground pines (*Lycopodium*) grow slowly, are easily exterminated and, in fact, have been very nearly exterminated in some areas. Certainly the indiscriminate use of these plants, our native hollies, mountain laurel, rhododendron, galax, and other evergreens can not be too strongly condemned and the use of material grown especially for decorative purposes is to be commended. The latter seems to be the exception, rather than the rule, and thought of the continued impoverishment of the native vegetation through indiscriminate collection of native plants for Christmas or any other season is an appalling one.

CHRISTMAS TREES

Although widely used in Europe, the Christmas tree tradition apparently was first introduced into America by the Hessian soldiers. The first description of Christmas festivities involving a decorated Christmas tree concerns a celebration at Fort Dearborn, Illinois, in 1804. The idea and tradition spread, with Christmas trees mentioned for celebrations in Cambridge, Massachusetts, in 1832 and Philadelphia in 1834, Cincinnati in 1835 and Richmond and Williamsburg in 1846.

The fir tree seems to be most closely associated with the Christmas tradition. It may be that the branches are more cross-like than those of other evergreen plants or that the trees retain their needles longer, or perhaps the characteristic odor proved of interest. In any case, the genus *Abies*, the fir, remains the most popular and perhaps most satisfactory tree today.

The growing of Christmas trees is a major forestry industry with the total number of trees distributed estimated at 28 million. Most are grown within the United States, but nearly 7 million trees are imported from Canada and a few from Newfoundland and Labrador. Of the approximately 21 million Christmas trees cut within the United States annually, approximately 13 per cent come from public lands of the Federal government, state or county governments. The remaining 87 per cent come from privately owned lands. Trees from government lands generally are cut on a definite schedule as a means of thinning forest plantings, al-

though a few counties are known to harvest Christmas trees as a means of income to support further conservation work. For the private landowner, Christmas trees may be a profitable crop. A plantation of Christmas trees may fit well into a program of land reclamation, forest establishment or profitable land utilization. The U.S. Department of Agriculture estimates that over 100,000 acres are now devoted to the growing of Christmas trees. A harvest can be made in 8 to 10 years after the planting of seeds. New England and the Middle Atlantic States probably supply 7 million Christmas trees annually for the domestic and export markets. Montana is the largest producer in the West.

The types of Christmas trees available in the New England area at Christmas include balsam fir (*Abies balsamea*), Douglas fir (*Pseudotsuga menziesii*), black spruce (*Picea mariana*), white spruce (*Picea glauca*) and red cedar (*Juniperus virginiana*). Smaller numbers of Scotch pine (*Pinus sylvestris*) and red pine (*Pinus resinosa*) are on the commercial market, while white pine (*Pinus strobus*) and the Canada hemlock (*Tsuga canadensis*) are also available but are less desirable.

These trees can be distinguished by the following key:

- Leaves scale-like, pointed, opposite; fruit a berry-like cone, usually blue or gray in color. Red Cedar
- Leaves needle-like or flat, borne in clusters or singly and alternate on the stems.
 - Leaves borne in clusters of 2 to 5, needle-like.
 - Needles 5, soft, flexible. White Pine
 - Needles 2, rather stiff.
 - Needles bluish-green or grayish-green, 1-3 inches long. Scotch Pine
 - Needles dark green, 3-7 inches long. Red Pine
 - Leaves borne singly and alternate or in a spiral fashion.
 - Leaves awl-shaped or needle-like, 4-sided.
 - Branchlets smooth; bark pale brown. White Spruce
 - Branchlets pubescent (with short hairs); bark blackish-brown. Black Spruce
 - Leaves flattened, linear.
 - Leaves abruptly narrowed at the base, when fallen leaving the stem roughened. Hemlock
 - Leaves generally not narrowed at the base, leaving a circular or elliptic scar upon falling.
 - Leaf-scar circular, flat against stem. Fir
 - Leaf-scar elliptic, slightly raised at the lower end. Douglas Fir

Spruce, fir and Douglas fir are generally preferred for Christmas trees because of their short needles and stiff branches. The needles of spruce fall readily, however. The long needles of pines with their lax appearance make these plants less desirable. The branches of hemlock are weak and the needles fall readily. Red cedars are narrow and upright with shorter branches and short, sharp, awl-like leaves and are not considered desirable for Christmas trees, although in restricted areas these trees may be popular.

Christmas trees for the commercial market are cut starting in October. The trees generally are bundled in large lots for ease of handling and to prevent drying out. When purchased, the tree should be kept out of doors or in a cool place until needed inside for decoration. Trees definitely retain their leaves longer when mounted in water. This supply of water should be replenished during the holiday season to prevent drying out and to delay needle fall. Various plastic compounds have become available in recent years, often in pressure spray cans to enable the purchaser of a Christmas tree to spray the tree and so retain the needles longer. A Douglas fir used as a Christmas tree at the Arboretum last year was felled by the hurricane in September. The top was cut off and kept out of doors until the middle of December, when it was brought into the heated building. The tree was then sprayed with plastic resin and no needle drop occurred during a period of three weeks of display.

Some nurseries offer plants to be used as Christmas trees which have been dug with the root system intact in a ball of earth wrapped in burlap. Since this is a living tree, it must be treated as such, for it will become active when brought into a warm room. It must thus be watered as frequently as any other house plant. When its use as a decorated tree is over, care must be taken not to kill the tree by transplanting it out of doors. Generally the frozen ground prevents immediate planting and the tree is better placed in a cold pit or cold cellar. Occasional watering throughout the winter is necessary. The tree can then be planted when the ground is no longer frozen.

Many people retain the family tradition of cutting their own Christmas trees. Advertisements appear in the local papers in areas where this is possible, for growers are often willing to sell trees they could not cut themselves or to allow the individual to select his own tree and cut it from a forest planting that needs thinning. In all cases, such cutting is done with permission. Cutting of Christmas trees on private property or in state forests is prohibited and the owner, whether an individual or the state, is protected by trespass and property-damage laws. Many states require a vender's tag to be attached to every tree to show its legal origin.

Further restrictions must be observed regarding insect and plant diseases. Many areas of New England are within the quarantine area for gypsy moth infestation and it is illegal to carry trees from this area without plant inspection. Gypsy moth eggs are common on Christmas trees. During the Christmas season inspection teams of government officials often patrol state lines to prevent the spread of the gypsy moth infestation. These officials have the right to confiscate trees being transported without a certificate of cleanliness. The current infestation of pine borer in New England can become serious if pine trees are transported to other areas for use as Christmas trees. The purchase of commercial trees from the many sources available during the Christmas season assures the home owner of a clean tree which will not bring disease or insect pests to the plants on his own property.

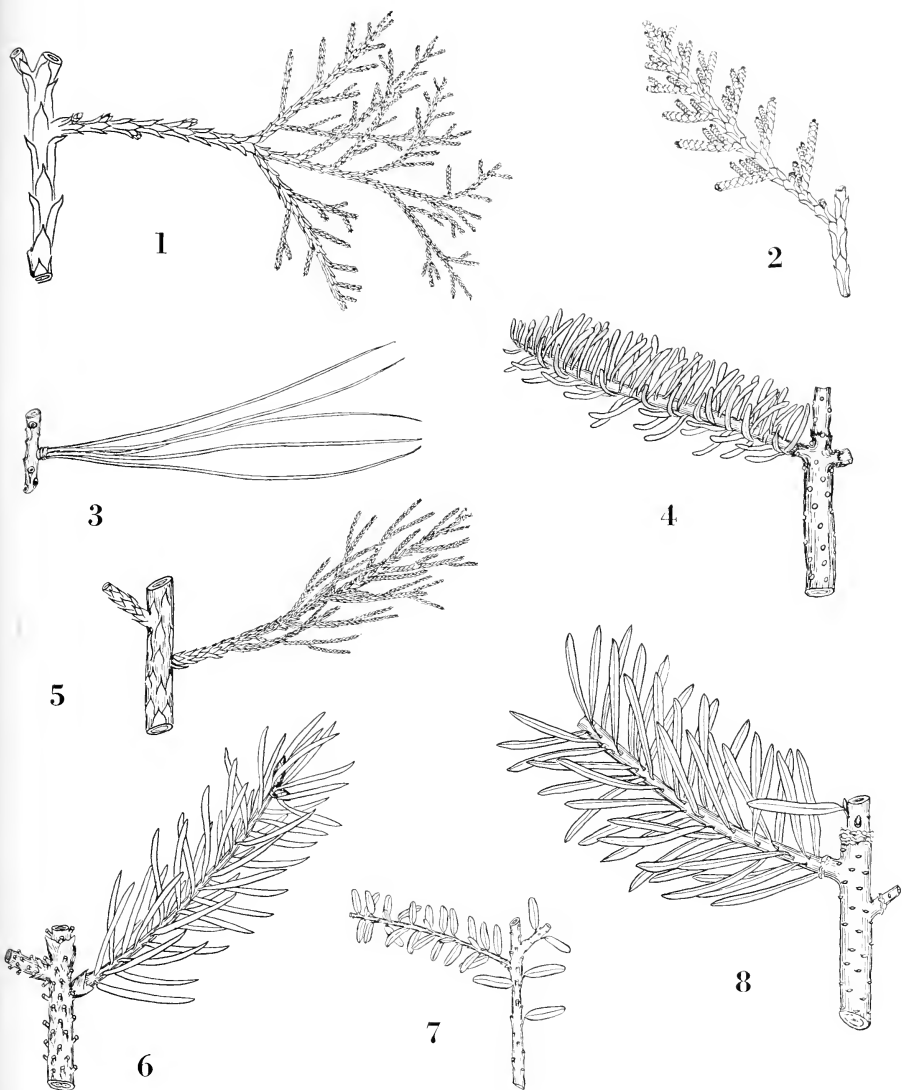


PLATE XI

Figs. 1-8, $\times \frac{2}{3}$. 1. White Cedar; 2. Arbor-vitae; 3. White Pine; 4. Balsam Fir; 5. Red Cedar; 6. Red Spruce; 7. Canada Hemlock; 8. Douglas Fir.

FRESH FOLIAGE PLANTS

Bottlebrush (*Callistemon rigidus*: Myrtle Family) (FIG. 14). This plant, originating in Australia, has appeared on the Boston market under common names so erroneous that they are not worth recording. The spectacular red filaments of the numerous stamens of flowers borne in close association on a leafless area of the brownish red stems give the appropriate common name "Bottlebrush" to the plant. When the stamens drop, the fruits expand and press against one another, remaining on the stem after shedding seeds until they decay. *Callistemon rigidus* has stiff, leathery, narrowly lanceolate leaves up to 5 inches long with conspicuous resin glands. The branches with capsules are used as greenery and hold up well.

Boxwood (*Buxus sempervirens*: Boxwood Family) is a common hedge plant of more southern areas. Christmas supplies of boxwood shoots are commonly obtained as cuttings of hedge plants or plants allowed to sucker for the purpose. Commercial supplies are picked about 12-18 inches long, but these are frequently cut into shorter lengths for wreaths, kissing balls and similar decorations. The small, roundish and convex leaves which are dark evergreen and shiny easily characterize this plant. Occasional specimens are seen bearing the small 3-4 parted capsules, each segment topped by a small styler point.

Corkscrew Eucalyptus, Spiral Eucalyptus (*Eucalyptus globulus*: Myrtle Family) (FIGS. 10, 13). Various species of *Eucalyptus*, all native to Australia and New Zealand, have been widely planted in the warmer regions of North America for their attractiveness, rapid growth, aromatic oils and honey-producing qualities. The species are all characterized by a polymorphic leaf-shape, for the leaves of the young shoots and those of the mature branches may be completely different in shape, size, and the length of the petiole. The branches of *Eucalyptus* known in the Christmas market as spiral or corkscrew eucalyptus are young shoots of *Eucalyptus globulus*. The leaves are sessile and opposite. In the "spiral" form the leaves have heart-shaped bases but do not overlap and the individual leaves are broadly ovate and about 1 inch long and wide. In the "corkscrew" form the heart-shaped bases of the leaves extend beyond the stem and tend to overlap the opposite leaf in a spiral fashion. The leaves of this form are generally longer than broad, usually 2-3 inches long and 1-2 inches wide. "Hard" and "soft" varieties of the corkscrew eucalyptus are recognized by the florist but these qualities seem to reflect only the age of the plant and perhaps the source. Commercial supplies come from Florida, California and Hawaii. The keeping quality of these shoots varies greatly. The attractiveness of the shoot is not diminished in the dry branches, however.

Emerald Palm leaves (*Collinia* [*Chamaedorea*] *elegans*, erroneously and widely known as *Neanthe bella*: Palm Family). Appearing on the Boston market in quantity from Texas and presumably imported from Mexico are bundles of 12- to 18-inch leaves of this small palm, a native of Mexico. The rather thin, dark green, pinnately compound leaves are used in wreaths, sprays and as fresh foliage. The

plant is readily grown from seed and small plants are sold almost throughout the year in dime stores and supermarkets as houseplants, a role in which they are quite satisfactory. The plants may begin to flower at a height of about a foot, producing small yellow flowers with a fleshy, almost berry-like perianth. The sexes are separate.

Galax (*Galax aphylla*, the specific name derived from the leafless stalk which bears the flowers: Diapensia Family). The leaves of this plant are used in wreaths and corsages at the Christmas season. The rounded or cordate leaves up to 5 inches wide have a wavy or coarsely toothed margin and are normally dark green and shiny. In the fall they color, often becoming a rich bronze which adds to their decorative value. The plant is a native of the southern Appalachian region and commercial supplies may be obtained from Virginia, the Carolinas or Georgia. In recent years these plants have been cultivated for the foliage in their native area, as well as in New England. In some areas the plant has become established locally after escaping from cultivation.

Holly (*Ilex* sp.: Holly Family) ranks as one of the oldest and most commonly used of Christmas decorations. Species of holly are found on nearly every continent and in a variety of climatic and environmental situations. The plants characteristically have the two sexes on different plants. In the past, only the female plants which produce the colored berries have been used in horticulture or as cut foliage for the Christmas market. More recently, the male plants have come to be valued for their foliage alone. Two principal species are used for foliage and berries in this country: the English Holly (*Ilex aquifolium*) and our native American Holly (*I. opaca*). English Holly is probably native from western and southern Europe to China and has been most widely used for its dark green, glossy, spiny-margined leaves with which the brilliant berries contrast strikingly. Nearly two hundred horticultural varieties of this species are known, including variations of size, shape and color of the leaves and the fruit. Forms with leaves variegated in green, gold and white are sold in the Boston market district. Commercial supplies of the English holly are obtained from growers in the northern Pacific states, although considerable publicity is given to that imported from England. Our native species, which has leaves of similar shape, dull green and with fewer teeth, is also available and is widely used farther south. The less attractive foliage and dull scarlet color of the fruit make *Ilex opaca* a second choice. Two native deciduous hollies are also sold for their fruits. These are the winterberries (or black alders, a singularly inappropriate common name), *Ilex verticillata* and *I. laevigata*. Supplies of the winterberries and American holly may be from New England or from states farther south to Virginia and the Carolinas.

Huckleberry (*Vaccinium ovatum*: Heath Family) (FIG. 12) is an evergreen shrub of the same genus as the blueberry. It is a native of the Pacific Coast States and commercial supplies are obtained from California to British Columbia. Formerly only a Christmas green, this handsome spray foliage plant is being used through-

out the year by florists. The leaves are short, $1-1\frac{1}{4}$ inches long, ovate and finely toothed on the margins. They are leathery, dark green and shiny above and paler beneath. The fruit is small, black and acid.

Magnolia leaves (*Magnolia grandiflora*; Magnolia Family). The leaves of this handsome, large tree of "moonlight and magnolia" fame in the Southeast may be 8 inches long and three inches broad on petioles $1-1\frac{1}{2}$ inches long. When fresh the leaves are a glossy dark green above and a rusty golden brown below. Many people buy the fresh leaves for decorations at Thanksgiving and allow them to dry out, after which they are gilded or painted as Christmas decorations. The large fruit, 4 inches long and $1\frac{1}{2}$ inches in diameter, bears rusty or golden hairs, and is occasionally used in decorating wreaths.

Podocarpus (*Podocarpus macrophylla* var. *maki*; Yew Family) (FIG. 11). The branches of this most commonly cultivated variety are sold for use as greenery. The flattened leaves to 2 inches long are dark green and glossy above and yellowish green below. The plant is a native of Japan and China, but is being grown for the northern markets in Florida.

Rhododendron, Rosebay, Great Laurel (*Rhododendron maximum*; Heath Family) is the common evergreen species of *Rhododendron* of the Appalachians. The large, thick leaves, oblong in outline, 5-10 inches long, and borne on petioles 1-2 inches long, are dark green, occasionally shiny above, and lighter colored beneath. Commonly used for a mass green effect, the commercial supplies are obtained locally in New England or are shipped from the full extent of its range.

Scotch Broom, Broom (*Cytisus scoparius*; Bean Family). A native of Europe, Scotch Broom has become naturalized in various parts of the United States where it is being gathered for its thin, green, leafless branches. The leaves are small, with 3 leaflets and fall from the plant earlier in the year. The brilliant yellow pea-like flowers are borne in abundance in late spring. Local supplies are from Virginia.

Shallon, Salal, Lemon Leaf (*Gaultheria shallon*; Heath Family) (FIG. 9). This plant, a shrub about 2 feet high with reddish branches and ovate, light green, leathery leaves up to 5 inches long, is an unlikely-looking relative of the eastern Wintergreen or Checkerberry (*G. procumbens*). It is a native of western North America from California to Alaska and commercial supplies are obtained from almost the length of its range. Salal is not hardy in the New England area.

Sweetbells, Leucothoe (*Leucothoe editorum*; Heath Family) is representative of an interesting group of deciduous and evergreen shrubs of Eastern America and Eastern Asiatic distribution. This species is native to the southern Appalachians but is widely used as an evergreen shrub in New England. As used for decorations, the old fruits generally are retained in racemes on branches bearing oblong to oval leaves 3 inches long. Commercial supplies are from local cultivated plants or from the Carolina mountains.

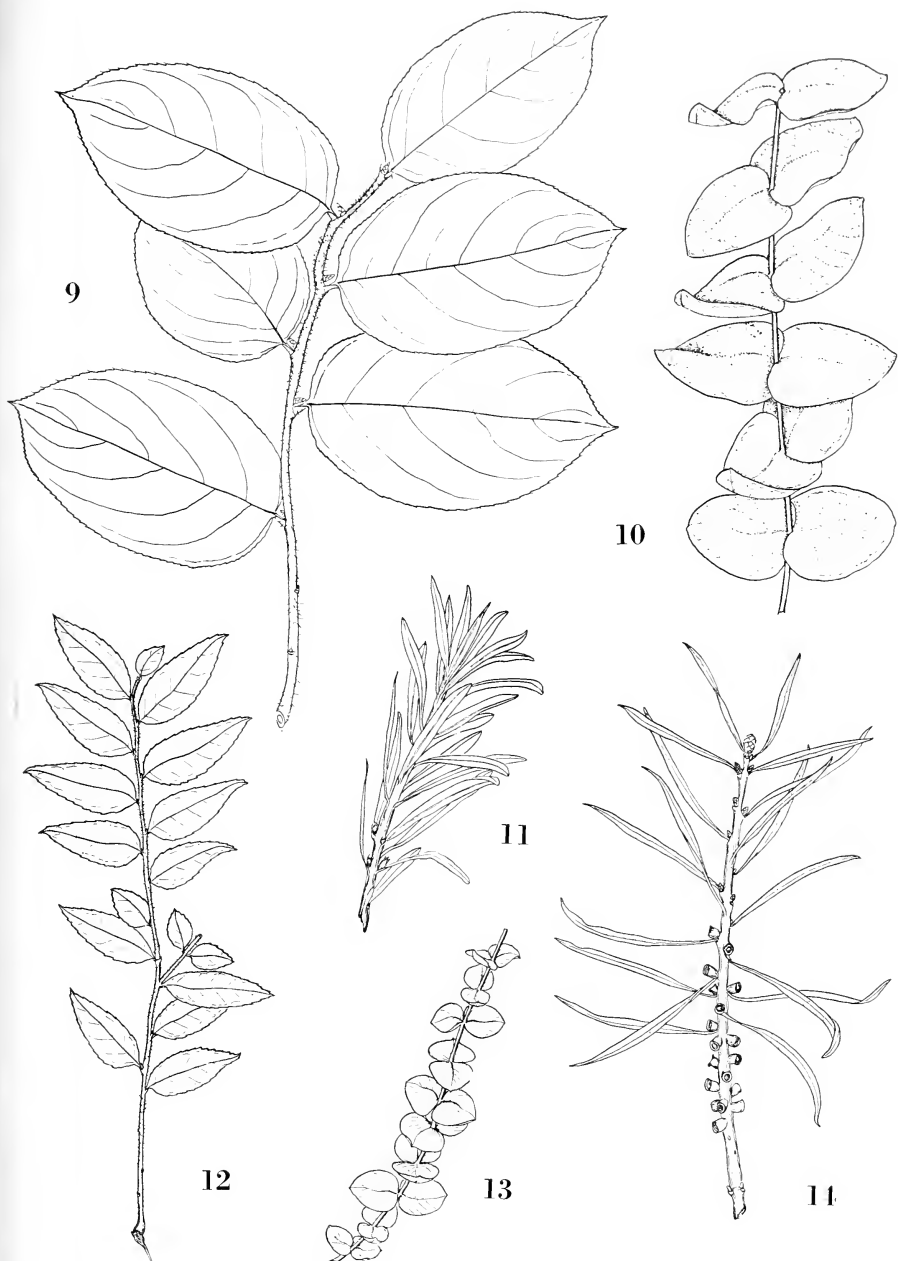


PLATE XII

Figs. 9-14, $\times \frac{1}{3}$. 9. Shallon; 10. Corkscrew Eucalyptus; 11. Podocarpus; 12. Huckleberry; 13. Spiral Eucalyptus; 14. Bottlebrush.

FRESH WREATH MATERIALS

Arbor-vitae branches (*Thuja occidentalis*: Pine Family) (FIG. 2). The branches form a flattened spray with minute scale-like leaves in two ranks. Those leaves on the top and bottom are almost flat, while the leaves on the edges are strongly keeled. The cones are about $\frac{1}{3}$ inch long with about 8-10 scales which are attached at the base. The tree is native to limey soils, especially bogs, over a wide northern area and extends southward to North Carolina and Tennessee on limestone cliffs, skipping Pennsylvania completely.

Asparagus Fern (*Asparagus plumosus*: Lily Family). This plant, not a fern at all, but closely related to the garden asparagus, is a tall climbing vine with flattened branch systems which give the plant its "ferny" appearance. The actual leaves are minute and scale-like and are not even green. The plant is available throughout the year and is commonly used in corsages and as greenery. Commercial supplies are greenhouse-grown or are from the far South or West. The species is a native of South Africa. *Asparagus sprengeri*, also a native of South Africa, is used less extensively than *A. plumosus*. In nature it may be a climbing vine with stems reaching 6 feet in length. As a house plant or greenhouse or conservatory subject it is commonly grown in baskets and the branches hang down. As in other members of the genus *Asparagus* the true leaves are reduced to scales and in this species the modified leaf-like branches are narrow and up to 1 inch long.

Club-moss, Ground-pine, Running Cedar, Christmas Green (*Lycopodium* sp.: Club-moss Family) (FIG. 31). These low evergreen plants with creeping or trailing stems have long been associated with Christmas in the New England area. Early historical records of the colonists indicate that these plants, visible in the woods in mid-winter, were among the first employed in the holiday season. Several species of *Lycopodium* are used in wreaths and greenery. Most extensively used is *L. complanatum* which has the branches apparently flattened and fan-like through the reduction of the leaves on the lower side. The 1-4 cones are borne on slender stalks which bear reduced scale-like leaves. *Lycopodium clavatum* has many long, running stems with the numerous hair-tipped leaves equally developed on all sides of the stem. A third much-used species is *L. obscurum* with a horizontal underground stem with erect, aerial branches resembling miniature trees. Portions of these erect stems dyed a deep green are used dried with cones and in wreaths to simulate evergreen foliage, presumably spruce. Other species sometimes used include *L. annotinum* and *L. lucidulum*. The former has unstalked cones while the latter has no well-defined cone, the spore-cases being borne in the axils of the upper leaves. Commercial supplies are generally obtained locally, although additional material is received from New York and Pennsylvania. The plants grow relatively slowly and indiscriminate gathering has nearly exterminated them in some areas. Florists' stocks are often carried over from one year to the next and the dried stems may then be artificially colored. A tropical species (*L. cernuum*), more Christmas-tree-like, 12-18 inches high, with short, erect cones, is occasionally seen in the Boston area.

Fir branches (*Abies balsamea*, or other species: Pine Family) (FIG. 4). The leaves are needle-like, flattened, with 2 whitish lines below. They are spirally arranged or so distributed as to give the branches a flattened appearance. A flat, circular scar is left when the needles fall off, leaving the branchlets smooth.

Incense Cedar (*Libocedrus decurrens*: Pine Family). With somewhat longer scale-like leaves and fewer cone-scales than arbor vitae, the flattened fan-like branches of incense cedar are more graceful than those of its relative. The plant is a handsome tree native from Oregon to Lower California with its best development in the Sierra Nevada of California. Bundles of branches are sold in the Boston markets.

Hemlock branches (*Tsuga canadensis* or *T. caroliniana*: Pine Family) (FIG. 7). The needles are short, flattened and whitish beneath. The Canada hemlock, usually seen, has flattish branches and small cones; the Carolina hemlock has the needles emerging at all angles and has larger cones. In both species the needles fall quickly, leaving a roughened stem.

Mistletoe (*Phoradendron flavesces*: Mistletoe Family). The European mistletoe (*Viscum album*), which our eastern American plant resembles, is one of the traditionally oldest plants associated with Christmas. Since the time of the Druids this plant as a parasite on trees, especially the oak, has been given religious significance. Our American plant is parasitic on many different species of trees, attaching itself to the water-conducting tissues of the tree. The plant is spread by white fruits which contain a sticky, mucilaginous material which may adhere to the beaks of birds which eat the fruit. The commercial Christmas market is a large one. Plants for the Boston area come chiefly from New Mexico and Oklahoma, although some supplies were seen from Tennessee, Kentucky and the Carolinas.

Mountain Laurel (*Kalmia latifolia*: Heath Family) is used at the Christmas season as green or wreath material. The plant is widespread in the eastern mountains and supplies are either obtained locally from the New England States or shipped from farther south.

Pine foliage (*Pinus* sp.: Pine Family) (FIG. 3). The leaves are of two types, the primary small and scale-like, spirally arranged and tightly compressed against short branches which bear 2-5 longer needle-like leaves, the whole branch forming a "fascicle" or bundle of needles. White pine (*P. strobus*) characteristically has 5 needles in a bunch; the long-leaf pine (*P. australis*) has clusters of 3 needles up to 12 inches long; red pine (*P. resinosa*) and Scotch pine (*P. sylvestris*) have 2 needles in each cluster.

"Smilax" of florists (*Asparagus asparagoides*: Lily Family) is a third asparagus species from South Africa. The plant is a branching vine with the leaves reduced to scales and the axillary branches flattened and leaf-like, ovate in shape and 1-1½ inches long. Commercial supplies are grown in greenhouses for the Christmas market and are obtained from many parts of the United States.

Spruce branches (*Picea* sp.: Pine Family) (FIG. 6). The needles are short,

spirally arranged, keeled above and below and thus four-sided or four-angled. Each needle is raised on a small peg-like base, so that the branches remain rough to the touch when the needles fall. Most commercial supplies for Boston are obtained from Maine and eastern Canada.

White Cedar branches (*Chamaecyparis thujioides*: Pine Family) (FIG. 1). The branches are only slightly flattened but the leaves resemble those of Arbor-vitae. The lower surface of the branches often shows white lines between the leaves. The cones are globular with the scales peltate (attached in the middle, umbrella-like).

Wild Smilax (*Smilax lanceolata*, primarily: Lily Family) is an unarmed evergreen member of a widespread genus. This high-climbing vine with broadly ovate shining leaves 2-4 inches long is shipped in tremendous quantities from the Gulf States for the northern Christmas market. Unfortunately the stems do not keep well, as the leaves tend to shrivel in drying.

DRIED FRUITS, FLOWERS AND CONES

Agave fruits (*Agave* sp.: Amaryllis Family) (FIG. 25). Several species of the century plant supply clusters of 3-parted capsules about 1-1½ inches long and ½ inch in diameter which are dyed or painted and used in Christmas wreaths and arrangements.

Acorns (*Quercus* sp.: Beech Family). Acorns used in Christmas decorations are generally covered with shellac or are painted. Unless the cups are present the acorns are difficult or impossible to identify. Only white, mossy cup and bur oak fruits could be recognized with certainty.

Artichoke (*Cynara scolymus*: Sunflower Family) (FIG. 21) was seen as the fresh cultivated form and the dried wild form. Local market supplies of fresh artichokes were commonly worked into flower or fruit arrangements. The mature and dried heads of this relative of the thistle were painted and dyed various colors. The outer bracts of the head of flowers were pointed and protruding in the dried specimens which were of the inedible wild form of this plant which has become naturalized in California. The artichoke is a native of the Mediterranean area but is grown commercially as a crop plant in California, the source of both fresh and dried flower-heads.

Australian Pine cones (*Casuarina equisetifolia*: Casuarina Family) represent fruit clusters of a flowering tropical tree (not a pine at all) which are erroneously called "cones." These fruit clusters less than ¾ inch long and ½ inch in diameter are used in dry corsages, decorations on wreaths and sometimes are fixed to parts of other plants. The commercial supplies are obtained from Florida where several species native to Australia are widely grown.

Bayberry (*Myrica pensylvanica*: Wax-Myrtle Family). This native plant has long been prized in New England for the wax which develops on the mature fruits. The sexes are on separate plants and only the female plants produce the fruits. The female flowers mature into dense clusters of bony, globular nutlets which,

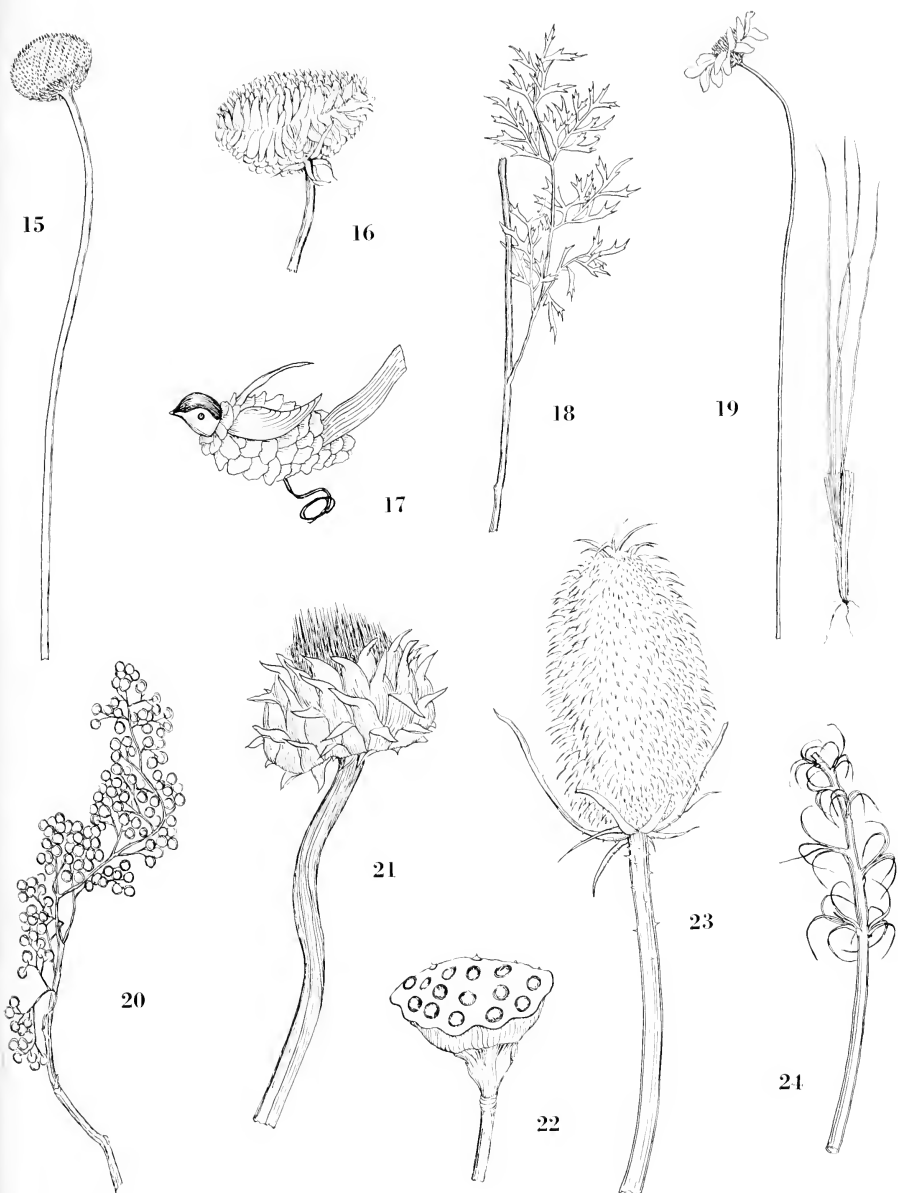


PLATE XIII

Figs. 15-24 (Figs. 16, 17, 23, $\times \frac{1}{2}$; Figs. 15, 19, $\times 1$; others $\times \frac{1}{4}$). 15. Flora Buttons; 16. Straw Flower; 17. Spruce Bird; 18. Prairie Parsley; 19. Star Flower; 20. Pepper Tree; 21. Artichoke; 22. Lotus; 23. Teasel; 24. Desert Primrose.

when dry, are covered with white waxy warts. The wax is removed from the fruit by steam or immersion in hot water and is used in making Christmas candles which have a characteristic fragrance. The stiff, leafless dried branches with the grayish fruits are used in arrangements and wreaths. The detached berries are often used in decorating other Christmas artifacts and are used whole on candles.

Cat-tail, Cat-of-nine-tails (*Typha angustifolia*, *T. latifolia*; Cat-tail Family). The narrow-leaved cat-tail is used especially in this area. It is easily recognized by the fruiting clusters of small diameter with a distinct separation between the female and the male flowers above. The other species has thicker fruiting spikes and the female and male flowers are adjoining. Both of these swamp-loving plants are of wide distribution within the United States, yet quantities of the former species have been imported from Italy.

Cotton bolls (*Gossypium hirsutum*; Mallow Family) (FIG. 26). The open capsules of cotton, carefully cleaned of all seeds and fibers, suggest a stylized 5-lobed flower and are sold either in their natural brown color or dyed, silvered, or painted. The upland cotton is used and supplies come from the South or from California.

Date Florets (*Phoenix dactylifera*; Palm Family) (FIG. 28) are portions of the date palm inflorescence possessing young and commonly abortive fruit or only the calyx lobes after the fruit has been picked. The larger inflorescence is broken into pieces about 10-12 inches long for sale. Some material appears to have been bleached and dyed. The much-branched staminate inflorescences, from which the flowers have fallen are sold as "male date calyx." Commercial supplies come from California.

Desert Spoons (*Dasylirion* sp.; Lily Family) (FIG. 33) are the expanded leaf bases of a desert relative of the Yucca. The leaf itself is long and narrow and has marginal spines which are hooked towards the apex of the leaf. The outer part of the leaf is cut off, leaving the basal 12-18 inches which are usually displayed in a vase with the white or yellowish leaf base upward. Occasionally the bases are dyed a brilliant color. The genus occurs in Mexico and the Southwestern States.

Locust fruits (*Robinia pseudo-acacia* or occasionally *Gleditsia triacanthos*; Bean Family). Mature seed pods dried and colored are used in fruit arrangements. Fruits of the black locust (*Robinia*) are about 2-4 inches long while those of the honey locust (*Gleditsia*) are up to 18 inches long. Both trees occur locally and are planted widely in eastern states.

Lotus (*Nelumbium nelumbo*, primarily; Water-lily Family) (FIG. 22). The large flat-topped and top-shaped fruiting receptacles of this well-known aquatic are used in dried arrangements. The fruits contain large seeds which may be loose or held tightly in the individual cavities in the fruit. This is an introduced pink-flowered species which is grown in many botanic gardens and has become established in waterways and lakes in the southern states, Texas and California. We have not determined whether our native yellow-flowered species is ever used; we hope not.

Milkweed pods (*Asclepias syriaca* and others; Milkweed Family). Local fields

apparently supply the commercial quantities of open and partially open milkweed pods seen in the florists' shops as Christmas decorations. The curved, swollen fruits with soft, recurved protuberances on the outside are often almost completely inverted. Partially opened pods are often sprayed with a plastic to retain the seeds in the pod. Fully opened pods which have shed the seeds are artificially colored.

Okra fruits (*Hibiscus esculentus*; Mallow Family) (FIG. 32). The common vegetable fruit of the South, an hibiscus as much as the swamp mallow or the rose-of-sharon, is represented in Christmas decorations, wreath ornamentation and dried arrangements by the dried fruits. The elongate capsule has been allowed to mature and is then dried and colored. The capsules seen had split lengthwise into narrow fibrous strips which remained appressed at the tip. The spherical brown seed rattled free in the fruits.

Pepper Grass (*Lepidium virginicum*; Mustard Family) is a common and familiar weed with numerous small, flattened fruit, notched at the tip, which fall apart into two halves when fully ripe. The plant is sold uncolored for use in dried arrangements.

Pepper-Tree fruits, Pepper Berries (*Schinus molle*; Cashew Family) (FIG. 20). The large clusters of small dried pinkish red 1-seeded fruits are used in their natural condition for decorations. While the tree is a native of South America, it has been planted widely in the American tropics and grown extensively as a street tree in California. Commercial supplies are obtained from that state. The plant belongs to the same family as poison ivy and some people are allergic to the touch of even the dried fruits.

Pitch Pine cones (*Pinus rigida*; Pine Family). This species is commonly used locally, but various other species are also represented. Pitch-pine cones are about $2\frac{1}{2}$ inches long when mature and open and are often as broad, conical in shape with the base flat. The scales have a short, sharp terminal spine.

Redwood cones (*Sequoia sempervirens*; Pine Family). The reddish-brown cones about 1 inch long are sold in cellophane bags to be used in making corsages and dried arrangements. The distinct peltate scales, broadly triangular at the apex, distinguish this cone.

Screw Bean (*Prosopis pubescens*; Bean Family) is the fruit of a mesquite tree of the dry areas of the southwestern United States. The fruit is a pod tightly twisted into a cylindric body $1-1\frac{1}{2}$ inches long. It is used in fruit arrangements and corsages.

Spiny Solanum, Spiny Tomato (*Solanum aculeatissimum*; Nightshade Family) is seen occasionally as the dried branches bearing fruits or as detached fruits among plants used as decorations. As the name suggests, this is a very spiny plant with the golden prickles of the stems and calyx adding to the attractiveness of the orange or orange-yellow fruit. The fruits $1-1\frac{1}{2}$ inches in diameter, retain their color even when dried.

"Spruce Birds" (FIG. 17) with bodies made from red spruce cones (*Picea rubens*),

molded heads and plastic wings and tails are being advertised widely. These clever painted birds are imported from Denmark where our native red spruce has been used extensively.

Starflower (*Syngonanthus* sp.: Pipewort Family) (FIG. 19). Sold in large bunches, the small, strawflower-like heads, white (but stained a brilliant red or a dozen other shades), borne on slender leafless stems led us completely astray, as did the report that these were imported from Europe. The plant proves to be a pipewort relative (see "Flora Buttons") which has a head of flowers with surrounding straw-like white bracts, the whole about $\frac{1}{4}$ – $\frac{1}{2}$ inch across, so that it strongly resembles a small straw flower. We now find that we have been seeing this for years as a component of the tiny dried bouquets which are sold in "shadow boxes." The plant is a native of Brazil where it must occur in enormous quantities in moist savanna areas. The leaves are about 2 inches long, very narrow and form a basal rosette.

Sugar Pine cones (*Pinus lambertiana*: Pine Family). The cones of this majestic species of the Sierra Nevada and the Coast Ranges of California and Oregon may be as much as 18 inches long. They resemble giant cones of the white pine, to which this plant is related.

Strawflowers (*Helichrysum bracteatum*: Sunflower Family) (Fig. 16) are occasionally called Everlasting, although in New England this name is usually reserved for *Anaphalis margaritacea*, which has grayish-white bracts at the outer edges of the head and yellowish bracts toward the center. The straw flowers are natives of Australia. The mature heads retain the brightly colored bracts after the fruit are shed. The bracts of the dried heads are usually of the red-to-yellow range. Heads vary in size to $2\frac{1}{2}$ inches in diameter. Straw flowers can be grown in New England as annual plants, but commercial supplies come primarily from growers in California.

Sweet-gum fruits (*Liquidambar styraciflua*: Witch-hazel Family). The "fruit" of this handsome tree is really a globular head of many fruits. The cluster appears spiny due to the two pointed beaks of each mature fruit. Most of the seeds are abortive and the woody capsules appear to be filled with sawdust. The fruit clusters are obtained from the southern states and generally are painted before they are sold.

Teasel, Fuller's Teasel (*Dipsacus fullonum*: Teasel Family) (FIG. 23). The dried fruiting heads may or may not be bleached and dyed in a variety of colors. The recurved bracts of the head distinguish this species from the commoner New England weed, *D. sylvestris*, which is also used. Both species are European in origin. The dried heads of Fuller's Teasel once had considerable use in carding wool.

White Pine cones (*Pinus strobus*: Pine Family) are from one of the most common pines of New England. The white pine has needles in bundles of five and has slender, often curved, nearly cylindrical cones. The cone-scales are thin, without recurved points and are commonly tipped with oxidized resin which adds to their attractiveness in decorations.

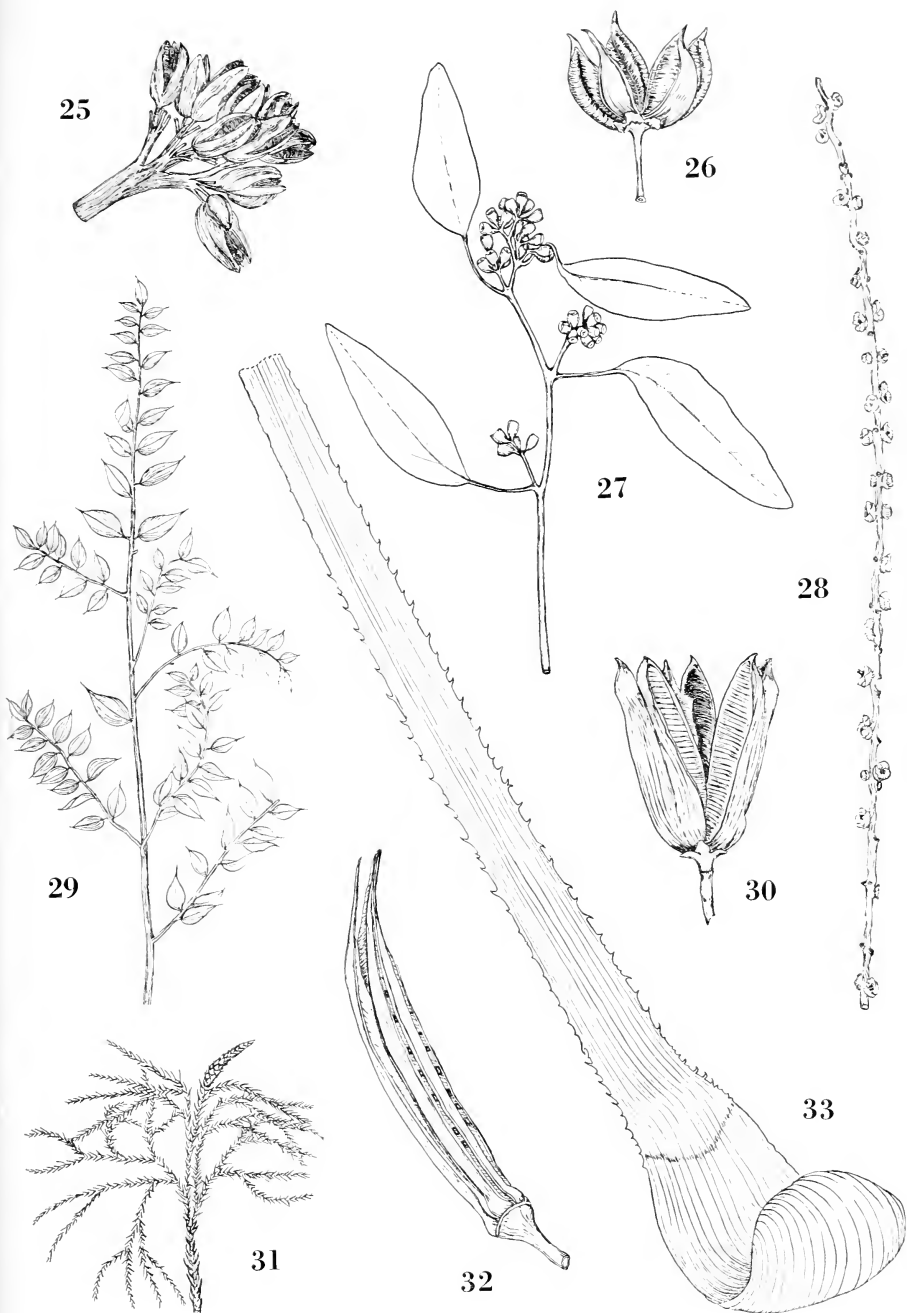


PLATE XIV

Figs. 25-33, $\times \frac{1}{2}$. 25. Agave; 26. Cotton; 27. Australian Beech; 28. Date Florets; 29. Butcher's Broom; 30. Yucca; 31. *Lycopodium obscurum*; 32. Okra; 33. Desert Spoon.

Winterberry (*Ilex verticillata*, *I. laevigata*: Holly Family). Often called Black Alder, these plants are abundant locally around swamps, ponds, streams and in damp thickets in the Eastern United States. In foliage, number of fruits and appearance of the branches the plant is extremely variable. The sexes are separate and the female shrubs which produce the short clusters of 1-8 bright orange-red fruits are valued for Christmas decorations in the leafless condition. Unfortunately the fleshy fruits dry out, shrivel and lose their bright color.

Yucca fruits (*Yucca* sp.: Lily Family) (FIG. 30). The large, 3-parted capsules, about $2\frac{3}{4}$ inches long and one inch in diameter, of western relatives of the widely-planted eastern Spanish Bayonet are seen in markets where they are sold singly, mostly silvered, gilded or otherwise painted. They resemble *Agave* fruits in general shape, but are easily distinguished by their larger size and by not being borne in compact clusters.

DRIED AND OFTEN PAINTED PLANT PARTS

Agave stem (*Agave* sp.: Amaryllis Family). Sections cut obliquely through the soft, woody mature fruiting stalk of species of *Agave* (and perhaps *Yucca*: Lily Family) are sold in the Boston market as bases for dried flower arrangements. Agaves, popularly known as Century Plants, have a large basal rosette of fleshy leaves. From the center of this rosette a large stalk is produced which bears the numerous flowers. The "agave stems" are cut from this large stalk. Commercial supplies are received from California and adjacent Mexico.

Australian Beech, Red Box, Eucalyptus (*Eucalyptus polyanthemos*: Myrtle Family) (FIG. 27). The mature fruiting branches of this Australian tree are common among materials for Christmas decoration. The mature leaves are lanceolate in outline, 3-4 inches long, oblique at the base and arranged alternately on the stem. The fruits, borne terminally and in the upper leaf axils in clusters and groups of 3-5, are about $\frac{1}{4}$ inch in diameter. The apex of the goblet-like fruit has a distinct smooth and thin ring. The specimens seen hereabouts are gilded, silvered or colored. Commercial supplies are from California.

Bunya-bunya (*Araucaria bidwillii*: Pine Family), is a member of a remarkable, ancient genus of scattered distribution in South America, South Africa, Australia and New Zealand. The bunya-bunya, native to Australia, is grown in Hawaii and California. The young shoots possess spreading ovate to ovate-lanceolate leaves up to 2 inches long arranged in two rows, but the mature foliage is arranged in a tight spiral and consists of leaves about $\frac{1}{2}$ inch long. It is the juvenile shoots which are dried and used in arrangements. Commercial supplies are obtained from California.

Butcher's Broom (*Ruscus aculeatus*: Lily Family) (FIG. 29). The apparent leaves of this plant are really dark green, ovate, sharp-pointed, flattened branches which are borne above the minute and scale-like true leaves. The flowers are borne in a cluster from the center of the flattened leaf-like stems and may produce orange-

yellow berries $\frac{1}{2}$ inch in diameter. For the Christmas market the branches are dried and most of those seen in the Boston area appear to have been partially decayed in water (until the outer layers have peeled off), dried and silvered or dyed a brilliant red. *Ruscus* is a native of the Mediterranean area and commercial supplies come either from Italy or from plants cultivated in either Florida or California.

Desert Primrose (*Oenothera deltoides*: Evening Primrose Family) (FIG. 24) on the Christmas market consists of the dried fruiting stalks with open fruits which have shed the epidermal layers. This white-flowered winter and spring annual of the Mohave Desert area reaches a height of one foot. Specimens may be a natural bleached color or may be tinted or dyed. Commercial supplies are from California.

Eucalyptus: See Australian Beech.

"Flora Buttons" (*Eriocaulon decangulare*: Pipewort Family) (FIG. 15). A marsh plant known in fresh condition as pipewort, this plant is common on the coastal plain from New England to Texas. The dried and colored globose flower heads which at first glance resemble those of tansy (*Tanacetum*: Sunflower Family) borne on thin 10-12 ribbed reed-like stems appear in the florists' shops at Christmas. Each head consists of many small fruits, each with a small pointed bract, giving the head a minutely bristly texture.

Palm Flowers (*Cocos nucifera*: Palm Family) are the fruiting calyces of the coconut palm. The small calyx of the flower expands with the development of the fruit. When the fruit is ripe these woody perianth parts can be removed as a unit and form a whorl of woody scales around an irregularly surfaced center. In wreaths and for corsages or artificial flowers these fruiting calyces may be used in natural form or may be painted or dyed. Occasionally artificial stamens are placed in the center of the rosette of calyx lobes to resemble a larger flower.

Palm Drift, "Fantazma," Embryo Palm-leaves, Unborne Palm-leaves (*Phoenix* sp.: Palm Family). These are the unexpanded or partially expanded leaves of either the date palm (*P. dactylifera*) or the Canary Island date palm (*P. canariensis*), taken from the terminal bud. The tree is killed in removing these leaves which are of various sizes and are used in dried arrangements. Commercial supplies are obtained from California and Arizona.

Pin Oak leaves (*Quercus palustris*: Beech Family). Cellophane-wrapped packages of oak leaves appear on the Christmas market as decorative materials. The leaves, mostly those of the pin oak, were bleached and pressed flat, still attached to the branches. Some materials are dyed in brilliant colors of yellow, orange or red and others colored to resemble true fall coloring (but not that of oaks). Most commercial supplies came from Indiana, although smaller lots were available from local sources.

Pine Roses (*Pinus* sp.: Pine Family). Pine cones when sawed or twisted transversely into whorls of scales are commonly used in wreaths and arrangements. A number of species of pines are used in this fashion. The tip of the cone is commonly used alone. The cone roses may be used in the natural condition or painted.

Poison Hemlock (*Conium maculatum*: Parsley Family). Dried fruiting stalks of this plant have been sprayed with "flock," according to the florists. The nature of this material is not known to us but appears to consist of short fibers of plastic or other glistening synthetic material. Colors are applied either by means of the "flock" or sprayed on afterward. These stems appeared in yellow, green, and blue. The stems bearing the characteristic compound umbels and fruit are used. The plant is notoriously toxic and supplied the classic poison drunk by Socrates. It is a native of Europe but is widely naturalized in the United States.

Prairie-parsley, Crinkle Bush (*Polytaenia nuttallii*: Parsley Family) (FIG. 18). Leaf-bearing fragments of the stems of this plant from which the flower and fruiting clusters have been removed are dried and painted and sold for wreath ornamentation and dried arrangements. Materials which we saw were painted with aluminum and then sprayed with a garish purple or rose. The plant is a native of the mid-western states and Indiana was the source of the commercial supply.

Ravenna Grass, Erianthus Plumes (*Erianthus ravennae*: Grass Family). The much-branched, plume-like flower clusters of this European grass are 12-18 inches long and 3-5 inches across. In their natural condition they are an attractive silvery-beige color but as sold in the Boston area as a dried ornament the panicles are dyed in miscellaneous colors and sold in gaudy bunches. The grass may be as much as 12 feet tall. It is cultivated as an ornamental and is hardy at least as far as New York. The soft, plumose appearance is given by fine silvery hairs beneath the spikelets.

Sea Lavender, Caspia (*Limonium* sp.: Leadwort Family) is a salt-marsh plant with a basal rosette of leaves and a much-branched inflorescence often 18 inches tall. Gilded, silvered or dyed in brilliant colors, the inflorescence of the plant is hardly recognizable and we have not been able to determine the species with certainty.

Silk-oak (*Grevillea robusta*: Protea Family) leaves when dried and colored one or several colors are used in arrangements and for ornamentation on wreaths. The much-dissected leaf comes from a large, fast-growing tree native to Australia. It has been planted widely in the warmer parts of the United States and is often grown as a pot plant. The dried leaves are obtained from Florida, California and Hawaii.

CHRISTMAS POTTED PLANTS

Christmas Cactus, Crab Cactus (*Schlumbergera Bridgesii*, erroneously known as *Zygocactus truncatus*: Cactus Family) is a native of tropical America. As a potted house plant it has long been a favorite from its habit of blooming profusely from the Christmas season through March. The flowers are usually crimson, although a number of color variants are now known. The drooping, flat, jointed stems are sometimes grafted onto other more erect species of cacti. Adventitious shoots of the stock plant may thus cause confusion.

Christmas Pepper, Cherry Pepper, Cone Pepper or Ornamental Pepper are common names for the small-fruited decorative (and very hot) varieties of *Capsicum annuum* (Nightshade Family). The forms cultivated as house plants flower at small size producing an abundance of round or pointed fruits. Dr. Charles Heiser, of Indiana University, who is studying the cultivated peppers, has kindly written that the two principal forms which we have encountered in the Boston area probably are *C. annuum* "Celestial," with fruits which progress from green to white to purple to red, and *C. annuum* "Floral Gem," with fruits which ripen to red omitting the purple phase. "Celestial" is said to have been introduced from China, but in both instances Dr. Heiser notes that the basic ingredients certainly came from Mexico, Central America or the West Indies.

False Jerusalem Cherry (*Solanum capsicastrum*: Nightshade Family), resembles the true Jerusalem Cherry (below) but differs in the smaller size of the plant, the broader leaves and the presence of hairs, many of which are star-shaped, on stems and leaves. This plant is a native of southern temperate South America. Compact or variegated cultivars are often available. Plants are grown from seed.

Jerusalem Cherry (*Solanum pseudocapsicum*: Nightshade Family) is one of the old-fashioned but still popular house plants for Christmas. It is available as a small pot plant and retains its orange or scarlet, globose fruits well. In Madeira, where it may be native, it may reach a height of 3-4 feet, but only compact dwarf forms are cultivated. "Cleveland Cherry" and "Patterson" are two of the better-known compact cultivars. The fruits are inedible and poisonous.

Orange Trees, Otaheite Orange (*Citrus taiensis*: Rue Family). Pot-grown specimens of the Otaheite Orange are popular Christmas plants. While the scientific name of this member of the citrus group suggests that it is a native of Tahiti, it is probably of hybrid origin and its place of origin unknown. Basically a dwarf type of plant when confined in root development, it will flower when a foot tall and produce both flowers and fruits almost continuously. The flowers are pinkish and the fruits are like small oranges, rarely over 2 inches in diameter. The flavor of the juice of the ripe fruit is disappointing.

Poinsettia (*Euphorbia pulcherrima*: Spurge Family) stands today as the most popular plant for Christmas. In the South and far West where it can be grown out of doors it is commonly in full flower during the Christmas season, being a short-day plant. In the North it is available in all ranges of size and price. The poinsettia has been known to botanists for nearly 200 years but its introduction to the commercial and horticultural market occurred only a little over 100 years ago. Its common name is associated with the man responsible for its introduction. Robert Poinsett, the first U.S. Ambassador to Mexico, sent a plant from Mexico to be exhibited in the horticultural show of the Philadelphia Horticultural Society in 1836. Buist, a Philadelphia nurseryman, introduced the plant to the trade. Since that time pink, white and yellow color variations and the so-called "doubles" have been selected for the Christmas market.

The poinsettia is characterized by having a peculiar cluster of staminate and pistillate flowers in one unit. The flowers lack the normal corolla and calyx and the conspicuous parts of the poinsettia plant are modified leaves which lack chlorophyll but have brilliant red or yellow pigments instead. Like the colored leaves of autumn, the brilliantly colored leaves of poinsettia are very sensitive to changes of temperature, moisture and abrasion and fall readily from the branches. The "double-flowered" forms are not that at all, but are selected forms which develop abnormal branches in the axils of the principal colored leaves and these small shoots, developing brilliantly colored stunted leaves form the "double poinsettias." The clusters of flowers on the modified axis are composed of 3-5 red, jointed stamens or male flowers and usually a single triangular female flower borne on a long and recurving stalk. At the base of these parts is a large, elliptical brilliant yellow nectar gland which in nature attracts insects which aid in pollination.

Poinsettia plants are difficult to handle and can not be shipped for great distances. The plants available in the florists shops are, therefore, generally grown nearby. Florists and nurserymen of New England import field-grown roots of poinsettia (generally from California) which are allowed to sprout in the greenhouse. Shoots are cut from these stocks and the cuttings are treated with growth substances to aid root development. The rooted cuttings are then planted in pots and sold for the Christmas trade. Thus the weak root system present contributes to the difficulties many people have in carrying these plants over the winter. The inclusion of a fern plant in the pot of poinsettia supplies additional green color. It is wise for the recipient of such a gift-plant to nurture the fern and cut out the poinsettias after the red leaves have fallen.

CUT-FLOWERS FOR CHRISTMAS

Bird-of-Paradise Flower (*Strelitzia reginae*; Banana Family). An exotic flower now frequently seen on the Christmas market, either greenhouse grown locally or shipped in from Hawaii, the West Indies or South Africa, is this native of the last locality. The strange orange and blue flowers are produced in a compact folded bract which incloses the buds. In nature one to several flowers will arise from the bract at one time, but as a cut-flower it may be necessary to lift each flower in succession from the bract. The dark blue "tongue" of the flower consists of 2 arrow-shaped petals which inclose 6 stamens of different lengths. The third blue petal is short and broad. The orange portions of the flower are sepals.

Christmas Rose (*Helleborus niger*; Buttercup Family). One of the unusual plants of the Christmas season is the Christmas "rose" which blooms naturally out of doors in New England in winter. *Helleborus* is a native of Europe and each year many plants are imported for American gardens. The cut-flowers of the florists are either flown in from Europe or are greenhouse forced for the season.

Flamingo Flower (*Anthurium × cultorum*; Arum Family). This plant, belonging to the same family as skunk-cabbage, jack-in-the-pulpit, the calla lily and phil-

odendron, has grown in popularity as an exotic cut-flower with the advent of modern transportation. Many are grown in local greenhouses, but large supplies come from Florida, the West Indies, Central and South America and Hawaii. The cultivated plant is derived from the hybridization in cultivation of at least 4 species of *Anthurium* with *A. Andraeanum* of Colombia. The plant is notable for the stiff, waxy, dark red to white, showy, modified leaf which is at the base of a finger-like spike of small and inconspicuous whitish or yellowish flowers. Thus it is an entire inflorescence or cluster of flowers which is sold. The flamingo flower keeps well and may last several weeks.

Star-of-Bethlehem (*Ornithogalum thyrsoides*: Lily Family). The bulbous genus *Ornithogalum* is European and African in origin. Two species, also called "Star-of-Bethlehem," were introduced into New England gardens many years ago, but escaped from cultivation locally and have become naturalized as a part of our spring flora. The Mediterranean *O. arabicum* and the African *O. lacteum* are cultivated in Florida and California for cut-flowers of the florist trade. The third species considered here is also cultivated in this country, although the largest supplies are shipped for the Christmas season from South Africa. Plants purchased in good condition may last as long as three weeks.

ARTIFICIAL PLANTS

Bonsai or Ming Trees. While these plants appear throughout the year, they are frequently featured as Christmas gifts. They may be available either as dish gardens or as block pieces for wall mounting. The trunks of these "trees" may be pieces of driftwood or the branches of the manzanita (*Arctostaphylos manzanita*: Heath Family), of the mountains of California. The "foliage" glued or wired to these branches is usually the entire plant of a low-growing species of false buckwheat (*Eriogonum*: Buckwheat Family), also from California, but may consist of mats of moss, sphagnum or other plant material. Most such "bonsai plants" are made by a local florist from material procured commercially from various localities. The finished production generally includes figurines and colored shell fragments. While these plants are called Ming Trees or Bonsai Plants by some, they should not be confused with the living, dwarfed trees which are properly termed Bonsai.

Many different kinds of **artificial fruits** made of plastic resins and attached in a variety of ways have been seen in displays, wreaths and shops. These make colorful, if unconvincing displays. One odd type of artificial fruit consisted of small white pellets $\frac{1}{4}$ - $\frac{1}{2}$ inch in diameter sprayed with adhesive and attached at random to branches of hemlock, spruce or to the naked branches of various hardwood shrubs, in some instances suggesting a bizarre cross between bayberry and snowberry!

One of the strangest artifacts from the botanical point of view was the ingenious combination of the large cone of the sugar pine (*Pinus lambertiana*) from the West with the leafy branches of the long-leaf pine (*P. australis*) from the South-

east. A hole had been bored in the base of the pine cone which was then thrust on the tip of the long-leaf pine branch. Although the botanists winced at the thought of such a hybrid, the public went right ahead and bought.

Neptune Fern. Sold throughout the year tied together in small bunches are brilliant green, slender stalks 4-6 inches long which apparently bear alternate, finely divided leaves greatly resembling the common aquarium plant, *Cabomba*. These are not plants at all but minute, colonial hydroids, relatives of the jelly-fish. This particular one, kindly identified for us by Dr. Elisabeth Deichmann, of the Museum of Comparative Zoology, is *Thuiaria cupressina* (the name alluding to *Thuja* and *Cupressus*, two perfectly good cone-bearing trees), which is found on both sides of the Atlantic, although local supplies come from England where it is especially abundant. The animals are allowed to decay away, leaving behind the remains of their transparent colonies which are then dyed green or, less frequently, red. Although these are completely and utterly dead when sold, we have been assured quite solemnly that the "plant" lives only on air, needs no water, and grows! One lady, of whom we know, carefully places hers on the window sill in the sunlight each day.

RICHARD A. HOWARD AND CARROLL E. WOOD, JR.

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